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Stephen W. Liska, Captain

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Spatial Analysis of Market Economy
Innovations in the former Soviet Union:
the Case of Commodity Exchanges

A Research Paper

Presented in Partial Fulfillment of the
Requirements for the Degree Master of Arts

by

Stephen W. Liska

The Ohio State University

October 6, 1992

Approved by

Dr. Yuri Medvedkov
Dept. of Geography

FORWARD

As this year nears a close, I would like to sincerely thank Yuri Medvedkov for his strong encouragements, patience, and guidance through my time at Ohio State - I am fully indebted in countless ways. I would also like to thank Emilio Casetti for all of those afternoons of quantitative methods, without which this paper could not have been a legitimate piece of work. And lastly, to Larry Brown, I am in gratitude for providing the necessary research on innovation diffusion to enable me to complete this final paper.

CONTENTS:

I). INTRODUCTION:

The ongoing transfer to a market economy in a splintered Soviet Union is exposing the regional inequalities in the land. Though the central command causing the inequalities has disintegrated, the new Republics cannot dissolve the economic legacies it has left them. Consequently, the favored European-core industrial growth poles have taken the lead in the adoption of market initiatives, while the underprivileged peripheral Republics search for direction. The course of each Republic's transfer to a market economy is forever affected by the legacy of the industrialization created by the Soviet Union. The new peripheral republics will have to struggle with their political instabilities and lack of available resources first before full-fledged capitalist measures can be taken.

In this paper, I test the Hypothesis of equal, spatial development of market economy innovations in the 148 provinces of the former Soviet Union. The hypothesis is tested using data on five specific market economy innovations of the last 4 years, namely 1) State-owned foreign trade businesses, 2) Significant Cooperatives engaging in foreign trade, 3) Significant Joint Ventures, 4) Foreign Trade Associations, and most importantly, 5) Active Commodity Exchanges.

Spatial analysis of the diffusion of commodity exchanges plays a substantial part of this paper, as it is the most recent market experiment and provides a glimpse into the continued

existence of regional inequalities.

II. DATABASE:

Data on the five market innovations mentioned in Section I was diligently tabulated from three 2,000+ page 1991 Business Directories and one Forecast Summary. The tabulation led to the creation of six new variables, annotated for the 148 oblasts, krays, or autonomous republics of the former Soviet Union. For the analysis, the tabulated variables were combined with some 57 existing variables from 116 provinces, as well as 10 other existing variables from 148 provinces.

Data was specifically tabulated from the following sources; first, the "1991 USSR Business Guide & Directory", a cooperative effort between The National Market Research Institute of the USSR Ministry of Foreign Economic Relations (VNIKI MVES) and Market Knowledge, Inc, USA. Included in this directory were all business concerns which the Ministry (VNIKI MVES) evaluated and concluded to have the resources to participate in foreign trade. The second source utilized, "Duns U.S.S.R. Exporters Directory 1991", was a cooperative effort between Goskomstat (State Committee of the U.S.S.R. on Statistics) and Dun & Bradstreet, U.S. 'Duns' provided up-to-date information (location, activities) on over 2,400 state-owned companies exporting products out of the Soviet Union and also on existing foreign trade associations. The third source, "Soviet Independent Business Directory (SIBD), 1991", was a cooperative effort between two companies, the Coop-

erative Reserve of Dnepropetrovsk and FYI Information Services, Washington, D.C. Listed in SIBD were businesses (cooperatives, joint ventures, enterprises), including sizes, type of activities, amount of Ruble turnover, etc. Lastly, the fourth and most critical source, "Predicasts, F & S Index - Europe", provided information on operational commodity exchanges from their inception in 1990 through June 1992.

The data for the above is not complete, but the mere abundance of geographic information leads to a significant analysis. Final results indicate the market economy innovations are diligently tied to the growth poles created by decades of massive industrial investment. Much the ongoing paper ties in to work by Olga and Yuri Medvedkov on Soviet growth poles and backwash and Soviet urbanization.

III). THE INNOVATIONS: AN INTRODUCTION:
    a). State-owned foreign trade Businesses (Figure 1a)
    b). Cooperatives (Figure 1b)
    c). Joint Ventures (Figure 1c, Table 1.1-1.3)
    d). Foreign Trade Associations (Figure 1d)
    e). Commodity Exchanges

    a). State-owned foreign trade businesses:

State-owned enterprises and firms have engaged in foreign trade for many years. The enterprises had a direct voice in negotiations with foreign partners through the Soviet Union Foreign Trade Ministry. Now, in a new era, these state firms are doing transactions openly in business directories mentioned earlier. These directories list thousands of state-owned plants, amalgamations, and enterprises seeking business abroad. A com-

prehensive list of all significant businesses resulted in the map
seen in Figure 1a. As expected, Moscow holds the largest share
of significant state businesses in foreign trade with 355
(22.1%), followed by St. Petersburg with 90 (5.6%), and Kiev 82
(5.1%).

b). *Cooperatives:*

The current cooperative movement in the former Soviet Union
can be traced to a law adopted in November, 1986 which permitted
family members residing together to form certain - very limited -
business ventures. By 1988, the Law on Cooperatives stated that
three or more persons could hire labor, lease or purchase busi-
ness premises and equipment, and operate on a large a scale as
may be desired. The same law allowed cooperatives to charge
freely negotiated prices for all goods and services not subject
to centrally dictated price levels. Public outcry against high
cooperative prices led to a new law in October 1990 to both
reemphasize price control measures and expand the types of busi-
ness activities in which the cooperative could engage, such as
directly in joint enterprises with the West (Soviet Business
Directory, 1991). Most cooperatives today average 10 to 15
people in size. By July 1991, there were 111,000 cooperative
enterprises in Russia, and 27,400 in the Ukraine employing
670,000 people. As of October 1990, 28.9% of all cooperatives
engaging in foreign trade were located in three cities; Moscow
(15.2%), St. Petersburg (8.4%) and Kiev (5.3%) (See Figure 1b).

c). *Joint Ventures:*

In the mid-1987, the Supreme Soviet passed laws allowing the formation of joint ventures (JV's) between then Soviet enterprises and foreign firms. In the initial regulations, the manager had to be a Soviet national, and at least 51 percent of the JV's property had to belong to a Soviet enterprise. More recent amendments have allowed ownership of more than 50 percent by a foreign firm. By December 1991, over 4,000 joint ventures were registered in the former USSR, with 46.7 percent of JV's registered in Moscow and St. Petersburg alone (see Figure 1c). Moscow alone holds 16 of the top 20 operational JV's according to domestic hard currency sales (over 4 mil. Rubls) (Table 1.1), as well as 11 of the top 20 JV's according to Ruble sales over 20 mil (Table 1.2), and 8 of top 20 JV's with over 1.4 mil Rubls in exports (Table 1.3). Germany is the most common partner with 13.7 percent of registered JV's, followed by Finland with 11.2 percent. Construction and timber accounted for the top JV activity at 12.6 percent, followed by Chemicals/Timber with 12.3 percent (Soviet Business Directory, 1991). Unfortunately, only 20 % of the joint ventures with U.S. are supposedly operating.

d). *Foreign Trade Associations:*

State-controlled foreign trade associations have emerged throughout the former Soviet Union as "representative" offices to provide assistance to foreign nations in trade regulations. Some of these associations are actually involved in the international trade of products. Many trade associations have appeared in areas of high joint venture activity. The geography (Figure 1d) of these associations provides a glimpse into the level of busi-

ness activity in the former USSR. Because they are a legacy of the Soviet Union Ministry of Foreign Trade, Moscow dominates in number of foreign trade associations with 124 of a total of 147.

e). *Commodity Exchanges:* See Sections VI - VII for detailed analysis.

IV). RANKINGS OF "MARKET INNOVATION-WELL BEING" BY PROVINCE:
TEST ONE: (Figures 1 - 4)

Simply adding the total number of joint ventures, coopera-
tives, commodity exchanges, etc for each province into a simple
quartile ranking produces a "Market well-being" index (see Fig-
ures 1 - 4). The resultant four quartiles containing 37 prov-
inces each provides a wealth of information.

The scores for the top quartile (Figure 1) can be correlated
to previous regional studies by Olga Medvedkov (Soviet Urbaniza-
tion). Eighty-two percent of the 37 provinces in the top quar-
tile contained "Type 01 - Restricted Population Growth/Signifi-
cant Cultural Development" cities identified by O. Medvedkov.
These Type 01 cities include Moscow, St. Petersburg, Kharkov, and
Tashkent, and are all characterized by "connectivity", that is,
well established links. Most top quartile provinces are repre-
sented by large cities and former republican capitals whose
populations were curbed by official restrictions, but whose
political and, specifically, economic importance were encouraged
by the development of services and supporting infrastructure.
They have benefited from centrality within communication net-
works, and thus have performed best in adopting market economy

initiatives. Moscow, the Baltics, oil-producing western Siberian cities, and oil and natural gas producing Volga and Kama regions dominate.

The same top quartile of "market innovator" provinces can be tied to work by O. and Y. Medvedkov on the Soviet legacy of growth poles and backwash (Disadvantaged Groups and Backward Regions in the Soviet Union). Growth Poles are large, self-sustaining industrial centers formed by years of massive state investment (capital, labor). The Medvedkov's paper finds 13 Dominant Growth Poles (DGP's) and 41 Rudimentary or secondary Growth Poles (RGP's) in the former Soviet Union. In this paper's ranking index, 11 of 13 (85%) top quartile provinces contain DGP's, and 16 of 41 top provinces (39%) hold RGP's.

The second quartile of market innovators provinces (Figure 2) contains some "high potential" provinces. Provinces here contain a mixture of 11 RGP's and 18 "Type 11 - Significant Population Growth/Significant Development" cities. Most of these provinces are the under-industrialized, up-and-coming provinces that never benefited from the massive state investment. Most provinces here respond well to rural vitality and show a spatial bias towards the southwest (Belarus), west, and northwestern borders, eastern Siberia, and the Far East. Many of these provinces are rich in natural resources that remain to be developed.

The third quartile (Figure 3) provides two patterns of note. First, all of the peripheral provinces surrounding Moscow are third quartile provinces. They have suffered the effects of "backwash" created by dominant growth pole Moscow. Their ability

to engage in business activity has obviously been strangled by Moscow, the top province in market innovations. The second pattern is the high percentage of border-located Free Economic Zones (FEZ) and Special Economic Zones (SEZ) within third quartile provinces. Economic Zones are areas intended to bridge the gap between the domestic economy and the outside world. They offer advantageous tax and import/export duties for foreign partners, and are commonly located adjacent to borders (Pravda). Twelve of twenty-three designated "Economic Zones" are third quartiles. It is the sheer distance from Moscow that prevented these regions from being industrialized, consequently their market innovation ability is low.

The provinces in the bottom quartile (Figure 4) are almost entirely represented by Central Asia. This is understandable. Central Asia is the "tragic experiment" of the former USSR. Soviet central planners for years treated the region as expendable for the glory of the Soviet economy. Industrialization of the region was uneven at best, without any long-term strategy (Rumer). The only plan for the region was for it to become the cotton base for the USSR. Even as recently as 1988, the Central Asian Republics received the lowest investment shares per capita than any other region. Therefore, their standard of living and quality of life are by far the lowest in the former USSR. All of these factors culminate into an inability to initiate any substantial market initiatives. Only a few provinces in Kazakhstan have potential to take steps forward (discussion later).

V).   TEST OF GROWTH POLE THEORY AND MARKET INNOVATIONS:
       TEST TWO: CANONICAL CORRELATION

As was mentioned above, the top quartile of market innovator provinces are closely spatially tied to the Growth Poles (Dominant and Rudimentary) created by the legacy of the former Soviet Union.   Growth poles attracted vast amounts of labor due to biased state investment into large industrial plants. Therefore, almost all growth pole provinces have high concentrations of populations. The DGP average province population size was 4.693 million with an average main city size of 2.325 million, while the average RGP province population size was 2.217 million and main city size 581,000.

The following canonical correlation tests for the Hypothesis of a one-way influence of province Growth Pole (P) on province Market Economy Innovations (I). A total of four indicators for each Pole (P) and Innovator (I) were selected from 148 provinces for the study.   Pole (P) indicators listed in Table 5.2 are derived from established sources, while Innovator (I) variables also in the same Table are derived from tabulations mentioned in the introduction of this paper. The hypothesis to be tested is the one-way influence,

$$P \quad \text{-----} \rangle \quad I$$

or specifically,

$$P\ (N,D,U,M) \quad \text{-----} \rangle \quad I\ (J,C,E,A)$$

Table 5.1 Province indicators for canonical analysis

```
      Growth Pole (P)         |     Market Economy Innovators  (I)
   ----------------------------------------------------------------------
   N  Population 1990        J    Number Joint Ventures
   D  Pop density/sq km      C    Number Cooperatives
   U  % Urban pop/province   E    Number '91 Commodity Exchgs.
   M  Main City Size         A    Number Foreign Trade Assocs.
   ----------------------------------------------------------------------
```

The initial correlation report below (Table 5.2) shows high correlation (.78 to .99) among the market innovator indicators and less correlation (-0.09 to .85) among the population growth indicators.

Table 5.2 Inter-correlation of indicators used to measure Growth
          and Innovation in 148 provinces

	N	D	U	M	J	C	E	A
N	1.0000	0.4671	0.3705	0.8547	0.7374	0.8380	0.7542	0.7272
D	0.4671	1.0000	-0.0943	0.4248	0.4064	0.4338	0.2964	0.5527
U	0.3705	-0.0944	1.0000	0.3236	0.2162	0.3566	0.3023	0.2118
M	0.8546	0.4248	0.3236	1.0000	0.8388	0.9307	0.7925	0.8475
J	0.7374	0.4064	0.2162	0.8388	1.0000	0.8232	0.8292	0.9886
C	0.8380	0.4338	0.3566	0.9308	0.8232	1.0000	0.7836	0.8313
E	0.7542	0.2964	0.3023	0.7926	0.8292	0.7836	1.0000	0.8193
A	0.7273	0.5527	0.2112	0.8475	0.9886	0.8313	0.8193	1.0000

Initial data analysis produces the following results;

Canonical Correlation	Canonical R-Squared	F-Value	Num DF	Den DF	Prob> F	Wilk's Lambda
0.9482	0.8990	42.41	16	428.13	0.0000	0.0550

thus, (P = 0.9482 I);   the Hypothesis is Accepted.

Table 5.3 below enables a study of the relevance of each particular weight of each indicator and its influence on neighboring indicators.

Table 5.3   Canonical Structure of Growth and Innovations

Indices	G (Growth)					I (Innovations)			
Initial data	N	D	U	M		J	C	E	A
Weights	.24	.05	.09	.73		.84	.82	.11	−.75
Corrln, P or I	.92	.46	.41	.99		.83	.93	.80	.81
% Variance extracted		55 %					49 %		

From observation of the weights in Table 5.3, we can remark the minor effect U (% urbanized province) and D (Pop density/sq km) have alone on market innovators (J,C,E,A). Main city size, M, however with a weight of .73 has a strong influence on the amount of market economy activity shown by J, C, E, A. Indicator Pole (P) is best represented by weight M and to a lesser extent weight N (Population). Indicator Innovation (I) is best represented by weights J (Joint Venture) and C (Cooperatives), and is inversely influenced by weight A (Foreign Trade Associations). Strangely, indicator I is hardly influenced by E (Commodity Exchanges). Correlations are high among the J/C/E/A and less so with N/D/U/M. The variance extracted from each indicator is not as high as desired at 0.55 and 0.49, but the final equation P ---> I is acceptable.

In summary, the correlation between two indicators Pole P and Innovator I is calculated as 0.9482 which is 95% of the maximum.   The greater the population of the main province city center, the more likely the adoptions of market economy innovations such as by joint ventures, cooperatives, and foreign trade

associations. The high state manpower investments into large industrial urban centers (growth poles) facilitates the adoption of the market economy initiatives. More specific discussion on regional adoption of market innovations will follow in this paper.

VI). THE INNOVATION OF COMMODITY EXCHANGES:

a). Description:

In its ongoing quest to move into a market economy, the former Soviet Union adopted commodity and other stock exchanges in 1990 as a new experiment and possible trend for the future (see Appendix 1 list). The goal is to open up trading of all kinds of surplus commodities. Former Soviet firms use the exchanges to sell above-plan (above state-order) output and to hunt for scarce supplies. Many exchanges began emerging throughout the country, some surreal (a stock exchange set up to trade shares that do not exist) to the very serious. The first serious exchange to be established in the former Soviet Union, the Moscow Commodity Exchange (MCE), opened in May 1990. The MCE trades in consumer goods, construction materials, and recently began trading in grain, oil, and financial instruments. Weekly volumes of trade at MCE averages 5 million rubles. Despite recent regulations, the MCE remains the most successful exchange in the country. There are questions, though, of the future survivability of the MCE and other exchanges.

O. Aleshko (Studies on Soviet Economic Development, Aug 1991) states that commodity exchanges can survive if previous

market economy transfer objectives are met. He proposes a solid pattern for the country's switch to a market economy which includes commodity exchanges. First, there must be reforms, followed by economic stabilization, and then the boosting of output, including the investment of domestic and foreign capital. The market transition is then accompanied by privatisation, an accelerated growth of small and medium-sized business, an anti-monopoly policy, the bankruptcy of insolvent enterprises, the establishment of effective money turnover, the creation of market infrastructure, and the opening of commodity exchanges and shaping of capital, labor and currency markets.

Along similar lines, L.G. Granberg (Studies on Soviet Economic Development, April 1992) notes the real success of commodity markets will depend on the de-monopolization, privatisation, and denationalization of part of the industries. He specifically states the future of commodity exchanges could be enhanced if the following situations occur; 1) privatisation of some of the industries to make the non-state sector take the dominant position in the economy, including complete exemption of enterprises in the non-state sector from tax on profits invested in production development, 2) a change in the concept of the state order and the granting of tax rebates to state enterprises, increasing the output of products over and above state order for authorized sales at free market prices, and 3) purposive steps to use the actually existing "black" and "gray" to lead to a civilized framework of joint-stock companies or "merchant houses", and granting tax rebates to those investing the bulk of their profits

in building up a modern material-technical and informational bases in certain regions.

So far, through June 1992, the Russian press has already reported over active 180 commodities exchanges sprouted in cities as diverse as Baltic Riga, and Central Asian Tashkent. Another reason for the vast growth of exchanges is that they represent a much less economic risk, for example, than possible uncontrolled operations with securities.

The relative stability of the existing exchanges is being reported through the broker's price per seat on the exchanges. The higher the seat price, the more significant the exchange. Significant deals are being made on some popular exchanges, leading many former Soviet firms to begin desperately paying high brokers prices to buy valuable seats (See Appendix 2, Seat prices).

Unfortunately, a recent Russian Federation government draft resolution (April 1992) has clamped down on major commodity exchanges dealing with its vital resources (oil, gas, grain, timber). The draft cancels all previous statutory acts in respect to the sale of oil, gas and products from their refining. The new government resolution introduces a "price corridor" system (regulated oil and other prices). This new "state monopoly" spells more trouble for these exchanges since they were already forced to only sell oil for consumption inside the country. Previous to the draft resolution, many exchanges had sought export licenses to sell oil for use abroad, but were rebuffed by the government as recently as March 1992. Consequently, the

restrictions of the new legislation will lead to drops in volumes of goods sold at exchanges, forcing many exchanges to either consolidate, become a trading house or holding company, or to close down for good. Unfortunately, the tougher legislation has only provoked and encouraged the development of illegal, black market business and the corruption in the state apparatus.

Because of the ongoing changes in commodity regulations, and consolidations and closures of exchanges, this study can only account for the emergence, and not the consolidation-closures, of commodity exchanges throughout the former Soviet Union.

b). Diffusion of Commodity Exchanges:

The rapid growth of the new innovation of commodity exchanges throughout the former Soviet Union brings forth many theories and notions. Two theories or hypotheses about the spatial adoption of exchanges are of interest. The first approach states the diffusion of these commodity exchanges assumes that all regions have an equal opportunity to adopt, and that differences in adoption times are explained by individual characteristics. The second approach (market and infrastructure perspective, by Brown, 1981) takes the stance that the opportunity to adopt is objectionable and in many cases purposely unequal Brown, 1981). In order to begin to understand the approaches at work, a quadrat analysis was performed.

A Quadrat analysis was first chosen to observe the spatial adoption of commodity exchanges. The goal is to observe for clustering or scattering of the exchange adoptions. Final re-

sults may provide hindsight as to which approach (above) plays the major factor in the adoption of commodity exchanges and for what reasons. The source for the analysis is Predicasts F & S Index - Europe edition (1990, 1991, 1992) which lists all active, operational commodity exchanges in the former Soviet Union as reported by the Russian press (Kommersant, DeloMir, Rynok, Ekon-Zhiz, Menedzhe, Izvestii, etc). See Appendix 1 for detailed list.

A map of the former Soviet Union (Scale: 1:28,000,000, Projection: Lambert Azimuthal Equal Area) was selected as the study area. For the quadrat analysis, the map was divided into 302 cells (approx. 81,225 sq km per cell), and the number of adopters per quadrat was determined at three separate time intervals: 30 June 1991 (Figure 6.2), 31 December 1991 (Figure 6.3), and 30 June 1992 (Figure 6.4). From this data, an R-statistic or Goodness of Fit was calculated as the ratio of the mean number of adopters per quadrat to the variance in number of adopters per quadrat. In general, an R value of 1 indicates a random distribution, values higher than 1 indicate a tendency towards uniformity, and values less than 1 indicate a tendency towards clustering (Thomas, Huggett, 1980). Reversing the R-Statistic values produces the Quadrat index values. These inferences are based upon the assumption that the population of potential adopters is randomly distributed. Initial results are listed in Table 6.1. All results are derived from the operation of a computer program exclusively written in the "C" computer language for this analysis (Appendix 3, program printout).

Table 6.1   Quadrat Analysis of the Distribution of Active
             Commodity Exchanges at Selected Times

	30 Jun 91	31 Dec 91	30 Jun 92
Cumulative number of adopters (n)	24	137	187
Mean number of adopters/quadrat ($x' = n / 302$)	0.079	0.452	0.612
Probability of No adopters/quadrat	0.924	0.635	0.538
Variance (s2) in the number of adopters/quadrat	0.120	1.135	1.972
Quadrat Index (s2/x')	1.509	2.501	3.184
R-statistic (x'/s2)	0.663	0.400	0.314
Result	Clustered	+ Clustered	++ Clustered

Table 6.2   Some Mean Province (Oblast) Characteristics of
             the three intervals of Adopters and Non-Adopters

	05/90-06/91 Adopters (n=24)	07/91-12/91 Adopters (n=113)	01/92-06/92 Adopters (n=50)	All	Non - Adopters
Main City '90 Size (000)	3,007	1,738	3,365	2,703	282
% RSFSR '89 Investmt	5.66*	4.50*	4.33*	4.83*	0.76*
% Urban '90 Populatn	76.5	74.4	79.9	76.9	55.5
# Foreign Trd Cooprtvs	78.4	58.7	87.9	75.0	3.9

* for Russian Exchanges only

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SEE APPENDIX 5 - DISCRIMINANT ANALYSIS RESULTS FOR VARIABLE
                 PREDICTORS OF ADOPTERS VS. NON-ADOPTERS OF
                 COMMODITY EXCHANGES
```

Figure 6.5   Number and Distance of Exchange Adoption in the
              the "Center" Economic Region for 1991

```
         i
         X (Moscow)
         i\
Number  20 + \
         i   \               95.8% of "Center"
  of     i    \              Exchanges located
         i     \             in Moscow in 1991
Adopters i      \
        10 +     \
         i        \
         i         \
         i          \
         i           \
         i            \ X (Yaroslavl)
         +--------+--------+--------+--------+
         O       100      200      300      400

              Distance from Moscow ( km )
```
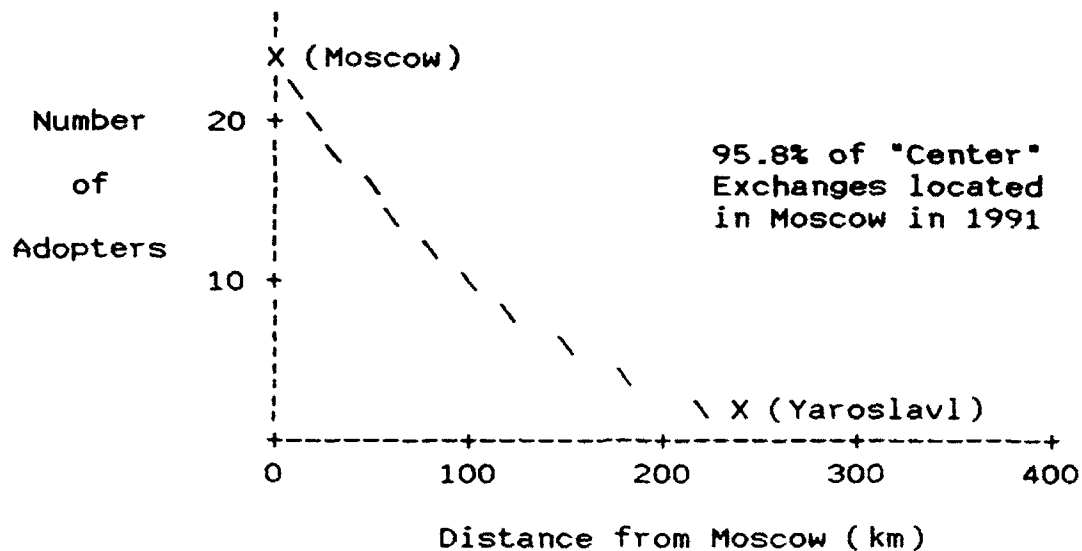
        Results   from the Quadrat analysis listed Table 6.1   clearly

indicate a spatial behavior of commodity exchanges from June 1990

to   June 1992.   The R-statistics for succeeding time   frames   are

increasingly   smaller   (.663, .400, .314)   indicating   the   major

shift towards clustering.   Cartographic evidence shown by Figures

6.1 through   6.4 indicates   a relationship   between the diffusion

patterns and   locations of dominant, populated city centers.   The

results   of   Table   6.2 show the combined three   time   frames   of

adopters   to have a large average city size (2. 703 million),   as

well   as   high urbanized population (76.9%),   while   non-adopters

held   an average main city size of 282,000 and urbanized   popula-

tion of 55.5 percent.   The correlation   report in Table 5.2 shows

Mean   City Size and cumulative 1991 Exchange Adoption   correlated

at r = .8145, while Population Density per Sq Km to 1991 Exchange

Adoption correlated at r = .6876.

        The   above   results give indication of one of   two   possible

prototype diffusion situations at work. Both situations deal with the topic of infrastructure. First, in the case of infrastructure-constrained diffusion, a uniform adoption is expected only within the area served by the infrastructure, with no adoption expected outside the infrastructure penetration boundary. And second, in the case of infrastructure-independent diffusion, a random distribution of adoption exists whereby the spatial extent is unlimited (Brown, 1981).

In the case of exchanges, the first situation appears to be at work. The increasing clustering of exchanges towards main city centers (Fig 6.5D), specifically centering on the focal points of existing city infrastructure, is evidence of infrastructure-dependence. Of the early adopters of exchanges (n = 24), 30 percent were located in Moscow and St. Petersburg, their main city centers being twice the size of the second interval of adopters (Table 6.1). The last time interval of adopters had an average main city size 3.365 million. In all, 34.7% of all active exchanges in the former Soviet Union are located in cities labeled "Dominant Growth Poles", and another 32.6 % of exchanges are located in "Rudimentary Growth Poles" (Medvedkov). Because of years of receiving high investment, the great cities provide the enabling actions for local exchange adoption, that is, the various publicly available infrastructures such as service, information, transportation, office buildings, and other incentives for adoption.

Figure 6.5 incorporates the notion of an infrastructure surface that is distance but seemingly not directionally biased.

In the Central Economic region, the density of adopters is highest within the city limits of Moscow (23), while the next and only other exchange adoption in the Center region occurs nearly 250 km out in the city of Yaroslavl. This is evidence of distance decay patterns outwards from the growth poles.

All of these results may be obvious - highly populated areas are more likely to adopt exchanges as a new market economy innovation. But a more beneficial question would be to ask what it is in these populated areas that facilitates the adoption of these new exchanges. Specifically, what agents or diffusion forces steer exchange adoption there? What internal or external factors are present to influence adoption?

c. Models for Diffusion:

Internal and external models of innovation diffusion can help explain some of the processes at work. For this analysis, the diffusion of commodity exchanges was examined using three different models; the Internal-Influence, External Influence and Flexible (Floyd) Models (See Figures 6.5 A - C). The exchange data was computed at 25 monthly intervals from the inception in May 1990 to June 1992. The assumptions in the analysis were 1) each urban system (city) either adopted an exchange or did not, 2) a constant ceiling, N', on the number of potential adopters in the urban system was estimated as all cities of greater than 121,000 in population, the size of smallest city adoption, and 3) the model permitted only one adoption per city (66 total), with no provisions for the discontinuance of the model once

established.

The fit of the models of the data appears reasonable, with R2 ranging from 0.87 to 0.89. The logistic Internal-Influence Model ($\ln F/(1-F) = at$) where F is the fractional share of cumulative number of exchanges at time t, showed the highest R2 at 0.8956. The logistic External-Influence Model ($\ln 1/1-F = at$) had a fit of R2 at 0.8730, while the mixed-flexible Floyd Model ($\ln (F/1-F + 1/1-F) = at$) showed an R2 in the middle, 0.8849. The above results prove that a mixture of factors are influencing the adoptions of commodity exchanges. The "decentralized-based" Internal-Influence model shows slightly better results than the "centralized-based" External Influence model. These results will point to later discussion when the adoption of exchanges are identified as taking place in a "decentralized decision-making structure with a coordinating propagator" (Brown).

d. Hypothesis Testing - Regression Analysis:

There have been some stated hypotheses seeking to explain the diffusion of commodity exchanges in the former USSR. Two hypotheses developed relating to Perestroika events of 1988-89. The first theory relates the location of exchanges to distinct gradients radiating from Moscow, St. Petersburg, and Kiev (DGP's with much maturity). The second hypothesis corresponds the clustering of exchanges towards earlier "market" economy initiatives, i.e. "business cooperatives". The Moscow monthly 'Vestnik Statistiki' suggested three other hypotheses; 1) former Central Departments turned to capitalize on existing staff, databases,

and communication equipment, 2) giant Industrial Plants create exchanges in order to survive in a new environment that lost its certainty about supply and demand, and 3) the former black marketeers close ranks and begin to function openly on a large scale according to market principles.

The five mentioned hypotheses were tested together for the Russian Federation using a surrogate variable for each Hypothesis (See Results, Appendix 4). Hypothesis DGP was replaced by "Main city size", Cooperatives replaced by "Number Cooperatives", Central Departments by "CPSU members", Industrial plants by "Percent investment share/province", and Black marketeers replaced by "Retail Sales per capita". Data from 71 Russian provinces were utilized; the final regression equation follows:

$$TOTCOMX = -2.76 + 0.0017 \; MCSZ + 0.0376 \; \#COOPS - 0.0017 \; CPSU +$$
$$0.6394 \; INVSMT + 0.0017 \; SALPC.$$
$$(\; n = 71; \; R2 \; (adj) = 0.8342; \; F = 71.44 \;)$$

Appendix 4 results show that the hypothesis on industrial giants (investment shares) to be most significant (.001 level) in explaining the diffusion of exchanges in the former USSR. The hypothesis on main city size was also significant, but at the 0.05 level.

There could be other factors influencing the diffusion of exchanges. In a following substantial study to be discussed, six influencing factors were discovered through a stepwise regression, with all factors relating to some form of government investment (later discussion); 1) previous level government in-

vestment (into existing urban system growth poles and infrastructure), 2) product availability for exchange, i.e. high location quotients of commodities (cash products, i.e. minerals, oil, gas), 3) previous experience in market economy innovations (cooperatives, joint ventures, state enterprises, already engaging in foreign trade), 4) education level, 5) available labor working in cooperatives, and 6) percent cropland available.

Each of the above influencing factors were derived from two sets of stepwise multiple regression tests. The first test utilized 60 variables for 116 provinces, and the second test used 17 variables for 148 provinces (*). The dependent variables were chosen as the cumulative number of commodity exchange adoptions in 1991, and the total number of adoptions in 1992. Table 6.3 stepwise regression results lists the "best" subset of independent variables for two tests (#1, #2). Table 6.4 lists simple regression results on the relationship between exchanges and labor. Table 6.5 also lists simple regression results between exchanges and selected independent variables. Table 6.6 lists stepwise results of "best" independent variable indicating seat prices at two time intervals.

footnote:

(*)   two sets of variables were used in the analysis because their large size prevented the creation of a single data set for use within the Number Cruncher Statistical System (NCSS).

Table 6.3 Stepwise Regression Results for Factors/Agents
           leading to Adoption of Commodity Exchanges

Labels of Significant Independent Variables in Analysis:

COMMXS91	–	# Commodity Erchgs, cumulative '91
COMMXS92	–	# Com. Excgs, adopted '92
TOTCOMMXS	–	Total number exchanges adopted, thru '92
MINING	–	Mining Location Quotient (LQ)
CHEM	–	Chemical Industry LQ
TEX	–	Textile + Apparel, Leather, etc LQ
MED	–	Medicine LQ
TC	–	Transport and Communications LQ
TRD	–	Trade and Catering LQ
PS	–	Power Supply LQ
LUM	–	Wood Process. + Furniture Indus. LQ, '87
HIGH	–	Univ Education Level, '79
RUSINVT	–	% State Investment / RSFSR Prov. 1970-89
RUSSINV89	–	% State Investment / RSFSR Province, '89
STATFORN	–	# State-owned businesses in For. trade '90
89RUSINV	–	% RSFSR investment per Province '89
POP90	–	Province Population '90, in 000's
UR%90	–	% Urban population in province, '90
MCSZ	–	Main city pop, '90, in 000's
#COOP	–	# Cooperatives in for. trde, '90
#JTVENT	–	# Active Joint Ventures, '90
#FORTDAS	–	(FORASSOC) # Foreign Trade Associations, 90
PRIM	–	Primacy 1st/2nd city size, '87
HEATING	–	Days heating season in year
BEDP10	–	Hospital Beds per 10k pop, '87
SALPC	–	Retail sales per Cap '86
TEKNIKUM	–	Teknikums total number / prov '87
PDENS	–	Pop Density '87
G50DENS	–	G.th 50K Cities in 10sq km, '87
SEATPRD1	–	Seat Prices on Exchanges, Dec 10-12, '91
SEATPRD2	–	Seat Prices on Exchanges, Dec 24-26, '91
TOOL	–	Machine Building LQ
AVTEMP	–	Average annual temperature, C
FOOD	–	Food Processing LQ
DOCP10	–	Physicians per 10k res, '86
SERPC	–	Services: RR pcap, '86
PMET	–	Primary Metals Production, LQ
MPT	–	Minor %, non-Russ, n-Rep speakers, 79
COBP10	–	Service outlets per 10k pop, 86
CAFP10	–	Catering outlets p10k pop, 86
KSQM	–	KSq. K Area in 000's sq km
CARS/KPO	–	Private cars per 000 pop main city, 89
SALESCAP	–	Sales: Consumer goods per cap, rub 89
MCGWT	–	Main city pop change 79-90
PPSQQKM	–	Pop/Sqkm; pop density per sq km

Table 6.3 continued:

TEST # 1:   Stepwise Regression Report (60 variables; n = 114)
            F-to-enter criterion 0.05

a. Dependent Variable : COMMXS91

IN-Variables	Corrltn	R2-Add	Prob	%RMSE
* MIN	0.143	0.010	.0005	11.3
TEX	0.013	0.006	.0054	6.6
* CHEM	0.049	0.009	.0009	10.0
MED	0.213	0.005	.0099	5.5
* HIGH	0.488	0.012	.0001	14.3
* TPOP87	0.840	0.013	.0001	15.4
#JTVENT	0.821	0.003	.0483	2.8
* TOTPOP79	0.712	0.012	.0001	14.1
TRD	-0.178	0.003	.0386	3.2
TC	-0.038	0.003	.0305	3.6
HEATING	0.085	0.008	.0014	9.2

* significant at .001 level for all Table 6.3 tests

b. Dependent Variable: COMMX92

IN-Variables	Corrltn	R2-Add	Prob	%RMSE
PS	0.200	0.010	.0048	5.9
MED	0.323	0.010	.0066	5.4
PRIM	0.620	0.012	.0030	6.7
BEDP10	-0.164	0.010	.0051	5.8
AVTEMP	-0.052	0.013	.0016	7.7
* #JTVENT	0.926	0.136	.0000	67.3

TEST # 2:   Stepwise Regression Report (17 variables; n = 148)
            F-to-enter 0.05 criterion

a. Dependent Variable: COMMXS91

IN-variables	Correltn	R2-Add	Prob	%RMSE
* POP90	.8523	0.017	.0007	8.7
UR%90	.4133	0.013	.0027	6.6
MCSZ	.8145	0.014	.0017	7.3
* STATFORN	.8318	0.063	.0000	31.2

b. Dependent Variable: COMMXS92

IN-variables	Corrltn	R2-Add	Prob	%RMSE
POP90	.8072	0.000	.0144	4.0
MCSZ	.8551	0.001	.0019	7.0
* #JTVENT	.9957	0.002	-.0000	23.2
#COOP	.8544	0.000	.0231	3.3
* FORTDAS	.9940	0.003	-.0000	35.1

Table 6.4 Simple Regression Analysis on the Distribution
          of Exchanges and Cooperative Development (n = 26)

	Independent Variables	R-Squared
Dependent: COMMXS91	Cooperative Labor (000's)	0.2087
	Coop. Total Sales (Rub mil.)	0.0518
	Coop Payroll (Rub. mil)	0.0611
	** All Workers / State Payroll	0.6009
	*** Cropland, th.ha.	0.3420
Dependent: TOTCOMMXS	Cooperative Labor (000's)	0.2090
	Coop. Total Sales (Rub mil.)	0.0449
	Coop Payroll (Rub. mil)	0.0511
	** All Workers / State Payroll	0.5958
	*** Cropland, th.ha.	0.3129

 **   RSq) 0.50
***   RSq) 0.30

Source: Narodnoe khozyaistvo SSSR 1988

Table 6.5 Selected Simple Regression Results with Dependent
           variables COMMXS91 and RUSINVT89 (n = 71)
           for Russian Exchanges Only

Dep: COMMXS91	Correlation	Adj R-Sq.
Variable: RUSINVT89	0.7169	** 0.5140
#COOP	0.7907	** 0.6224
#JTVENT	0.8384	** 0.7006
FORTDAS	0.8265	** 0.6810
STATFORN	0.8638	** 0.7441
TEK	0.6086	0.3647
PRIM	0.4128	0.1630
G50DEN	0.4997	0.2430
PDENS	0.4566	0.2014
SALPC	0.4373	0.1840
HIGH	0.4882	0.2384

** RSq) 0.50

Table 6.5 continued:

Dep: RUSINVT89 (for Russian Exchanges only)

		Correlation	Adj RSq.
Variable:	COMMXS91	0.7169	** 0.5140
	#COOP	0.4868	0.2370
	#JTVENT	0.4377	0.1916
	COMMXS92	0.4911	0.2412
	FORTDAS	0.4378	0.1917
	STATFORN	0.4898	0.2399
	SEATPRD1	0.5129	0.2651
	SEATPRD2	0.7534	** 0.5421

** RSq > 0.50

Table 6.6   Stepwise Regression Report on Average Seat Prices
(Rubles) of Dec 10-12, 1991 (SEATPRD1)
and Dec 24-26, 91 (SEATPRD2) on Com. Exchanges

Dependent: SEATPRD1 (n = 25)

	IN-Variable	R2-Add	Prob	%RMSE
	TOOL	0.020	.0039	6.0
	PRIM	0.011	.0259	3.2
	#COOPS	0.009	.0465	2.4
*	STATFORN	0.054	.0000	16.7

Dependent: SEATPRD2 (n = 31)

*	#JTVENT	0.031	.0003	9.3
*	RUSINVT89	0.052	.0000	15.8

* Sig at .001 level

VII). GENERAL ANALYSIS OF RESULTS:

The above Tables of "best" subsets of independent variables provide a wealth of information on factors affecting the distribution of commodity exchanges. Results reinforce the spatial inequality of market economy innovations in the former Soviet Union. Consolidation of all of the tables reveals the following contributing variables to the development and established seat prices of commodity exchanges.

I). For the Distribution of Exchanges:
```
  *    a) Location Quotients (* MIN, CHEM)
  *    b) Urbanization/Pop Growth (* POP90, TPOP87)
  *    c) Previous "Market" Innovations (* #JTVENT, FORTDAS)
 **    d) Available Labor (** All Workers State Payroll)
***    e) Cropland (*** Cropland, th.ha.)
  *    f) Education (* HIGH)
 **    g) Russian Oblast Investment (** RUSINVT89)
```

II). For Seat Prices on the Exchanges (selected indicators):
```
       a) Location Quotients (TOOL - sig .003)
       b) Urbanization / Population Growth (PRIM - sig .02)
  *    c) Previous "Market" Innovations (* #JTVENT)
  *    d) Russian Investment (* RUSINVT89)
```

```
  * Sig at .001 level in stepwise regression
 ** RSq > 0.50 in simple regression
*** RSq > 0.30 in simple regression
```

I). a. Location Quotients:

In Table 6.3 (Test # 1), the Stepwise Regression Analysis lists Location Quotient variables for "Mining", "Textile and Apparel", "Chemical Industry", "Transport and Communications", and "Trade and Catering", and "Power Supply", as active variables influencing the distribution of commodity exchanges in 1991 and

1992.   The results are not surprising. One of the key factors
responsible for the overall crisis in the former Soviet economy
is the increasing problem of shortages of supplies (raw materi-
als, intermediate goods, equipment, etc.), which occurred when
the centralized distribution system broke down. Thus, a number of
commodity exchanges sprung into existence across the country to
fill the void of shortages, as enterprises have sought to ex-
change products for needed supplies to avoid turning over their
output (above the previous state order) into the state distribu-
tion system at set prices ('News Notes', Soviet Geography, Octo-
ber 1991). The higher location quotient figures (above one) are
indicative of the surplus of a particular product, thus of its
availability for trading on an exchange.

   b. Urbanization / Population Growth:

   Table 6.3 (Test #1) results also reconfirms part of an
earlier statement made about the relationship between urban
growth systems and the distribution of exchanges.   For 1991
exchanges, variables "Total Population" for 1987 and   1979
(Prob. .0001 and .0001, %RMSE 15.4, 14.1) indicate the emergence
of exchanges towards highly populated areas.   The populated
areas, such by cities, provide the infrastructure to facilitate
adoption of exchanges. For 1992 exchanges, variable "Primacy
Rate", another urban system factor, tested at Prob. 0030, and
%RMSE 6.7. Furthermore, Table 6.3 (Test # 2) results further
confirm comments made above about Test # 1. Urban growth system
variables are all good predictors of exchanges, as can be seen
from the following variables;   "Population" (1991 Exchanges:

Prob. .0007, %RMSE 8.7, 1992 Exchanges: Prob. .0144, %RMSE 4.0),
"Percent Urban Population per Province" (1991: Prob. .0027, %RMSE
6.6), and "Main City Size" (1991: Prob .0017, %RMSE 7.3, 1992:
Prob .0019, %RMSE 7.0).

c. Previous "Market" Innovations:

Previous existence of market economy initiatives in regions
is a factor influencing the development of exchanges. Results
confirm the probable continued growth of spatial inequality of
market initiatives in the former Soviet Union. New commodity
exchanges are only being adopted in areas already familiar with
"market" experiments. Table 6.4 reveals the total percentage of
Business Cooperatives' Labor to have R-Square value 0.21 with the
number of exchanges in 1991 and total number of exchanges through
1992 - a minor relationship, but there is some link.

Table 6.3 stepwise regression results demonstrate an in-
creasing relationship between the number of exchanges and "mar-
ket" initiatives listed in the Business Directories (see Intro-
duction). The following relationships are significant; "Number of
State-owned Businesses in Foreign Trade" (1991 result:
Prob .0000, %RMSE 31.2), "Number of Significant Joint Ventures"
(1991: Prob -.0000, %RMSE 2.8, 1992: Prob .0000, %RMSE 67.3),
"Number of Significant Cooperatives engaging in Foreign Trade"
(1992: Prob .0231, %RMSE 3.3), and "Number of Operational Foreign
Trade Associations" (1992: Prob -.0000, %RMSE 35.1).

d. Available Labor:

The number of commodity exchanges emerging is very closely

tied to the amount of state labor available on an average month (Table 6.4, R-Sq. 0.60). Much of this relates to the years of Soviet industrialization which sought to attract the nation's labor towards few large factory plants (growth poles) at the expense of the countryside (see Section VII below). These plants became the sites of large urban centers, complete with the infrastructure needed for the daily operation of the city. As was shown earlier, the number of commodity exchanges is highly tied to the urban system.

e. Cropland:

Another consequence caused by growth poles is the attraction of croplands around its periphery. Since we have shown high number of exchanges located in current growth poles, we can also demonstrate a high percentage % of croplands explaining location and number of exchanges (1991: RSq .342).

f. Education:

Table 6.3 stresses the importance of higher education (1991 Prob .0001, %RMSE 14.3) on exchanges. The higher the "University Level Education", the more likely the exchange adoption in 1991.

g. Percent RSFSR Investment Share (see Section VIII)

II). Seat Prices (a - c)

Average brokers' seat prices in rubles (Figure 6.6, Appendix 2) on commodity exchanges are also indicative of the relative advance or lagging of the market economy innovations in provinces/cities (Table 6.6). Seat prices specifically give clues as

to the relative standing of various exchanges in the eyes of the business community. The higher the seat price, the more signifi-cant the operation of the exchange, and the better it stands on market innovation. The significant factors influencing average seat prices (from Dec 10-12 and Dec 24-26, 1991) are similar to factors influencing adoption of exchanges in the first place, specifically, location quotients, population growth/urbanization, previous market initiatives, and amount of previous State invest-ment.

The 25 average seat prices listed in "Ekonmicheskaya Gazetta" for period December 10 - 12, 1991 (Figure 6.6), when undergoing a stepwise regression, produce best indicator variables such as "Machine Building Location Quotient" (Prob .0039, %RMSE 6.0), "Primacy Rate" (Prob .0259, %RMSE 3.2), Number of significant Cooperatives in Foreign Trade (Prob .0465, %RMSE 3.2), and more importantly, number of "State-owned Businesses engaging in For-eign Trade" (Prob .0000, %RMSE 16.7). In summary, foreign trade activity and urbanization are highly correlated to brokers' seat prices requested on December 10-12, 1991.

The availability of more data on average seat prices (n = 31) for the period December 24-26, 1991 (Figure 6.7, Appendix 2) increases the validity of Stepwise results in Table 6.6. Active variables "Number of Joint Ventures" (Prob .0003, %RMSE 9.3) and "Percent Share of RSFSR Investment per Province" (for Russian Exchanges only, Prob .0000, %RMSE 15.8) are very strong indica-tors. Foreign trade activity (joint ventures) and the previous state involvement (level of 1989 State Investment per Russian

province) prove important also.

The concept of state investment shares influencing the development of commodity exchanges in the RSFSR is an important concept. Figure 6.8 shows an RSq of 0.52 between percent investment share and seat prices on exchanges. More discussion below.

VIII). SPATIAL IMPLICATIONS OF STATE INVESTMENT
ON THE ADOPTION OF EXCHANGES

One would like to believe it is the inherent innovation and "business" initiative of the ex-Soviet people alone that led to the emergence of commodity exchanges throughout the region over the last two years. However, the close relationship between 1989 State investment shares per Oblast and the number of commodity exchanges provides a glimpse into the existence of external contributing factors. The simple regression results in Table 2.4 show dependent variable "1991 Commodity Exchanges in Russia" and variable "1989 Russian Investment Share" to be correlated at 0.7169, with an R-Square of 0.5140. Of note is that same variable "1989 Russian Investment Share" is found to be only significant with variables dealing with commodity exchanges (seat prices, location of exchanges), and not with any other earlier market innovations such as joint ventures or cooperatives. Therefore, the higher the 1989 investment figures per Oblast, the greater number of exchanges and the higher the seat prices on those exchanges.

The above figures brings forth two possible related theories

that deal with regional investment; 1) State investment, and not the innovation of the people alone, appears as the indirect impulse agent (coordinating propagator) for the emergence of commodity exchanges in decentralized Russia in 1991, and 2) biased State investment (towards large regional industrial centers) directly impacts the spatial adoption of market economy innovations (exchanges) in Russia today and will have significant consequences for the future.

The first theory of state investment indirectly leading to exchange innovation diffusion can be tied to ideas presented by L. Brown (1981). In this particular case, we can view the establishment and spread of commodity exchanges as indirect "diffusion agencies", rather than processes by which individuals alone gained membership and participation. Specifically, this could provide an example of a "diffusion agency establishment under a decentralized decision-making structure with a coordinating propagator" (Brown , 1981). This can be so in that each exchange generally was established by different sets of individuals independently of one another, but the government provided the earlier incentives (higher investment per region) and impulses which indirectly provided the grounds for commodity exchange establishment, favoring some areas more than others. Results from the earlier study employing the "decentralized-based" Internal-influenced model for innovation diffusion also supports this theory.

The second related theory of biased investment affecting commodity exchange development is evidenced by percentage shares, in that some regional areas dominated by large urban industrial

centers continue to receive preferential treatment over other areas. The 1989 investment figures during the height of Perestroika reveal the State purposefully targeting certain regions with vast investment (European core centers, Western Siberian centers), thereby amplifying the unequal opportunities for market economy reform and specifically, the opportunity for equal adoption of commodity exchanges, in today's decentralized system.

The biased 1989 "Perestroika" investment figures represent the continuation of the Soviet legacy of industrialization and years of biased regional investment. In the Stalinist command economy, with its extreme centralization, geography was denied by enforcing the goals of the center, often at the cost of most regional standards. The extensive development strategy that promoted heavy industrialization also generated a core-periphery pattern of development, with the Central Asian and Siberian peripheries providing the natural resources for the European core (Bradshaw). This led to the development of growth poles, centers dominated by large giant factory plants that absorbed all of the nearby labor, energy and supplies in the name of national priorities at the expense of tributary regions (Medvedkov). When capital was mobilized, cost-consciousness forced ministries to continue to feed investment into areas of existing infrastrucure, towards the big cities. The smaller peripheral cities were thus neglected, as they lacked the infrastructure and adequate labor supplies to attract additional investment (Shaw). Consequently, today the periphery remains immature; it has "backwash" from the growth poles (Medvedkov).

Unfortunately, even as late as 1989, the allocation of investment remained tilted towards the regions of Soviet industry (large urban industrial centers and natural resource centers). The market-oriented reforms of 'Perestroika' only amplified the existing regional inequalities by concentrating investment in the European machine - building urban industries and factory output areas (Bradshaw, 1990). A look at Figure 7.1 reveals the in- equality of the 1989 investment shares. Thus, the problem re- mains regional - low investment leads to lower production, and a low ability to adopt market economy innovations (exchanges).

IX). A REGIONAL ANALYSIS OF THE DISTRIBUTION OF EXCHANGES: POSSIBILITIES FOR FUTURE BUSINESS ACTIVITIES?

With all of the tested results, we now can get a better look at the geography of the commodity exchanges and understand the reasons that led to their adoption. Analysis here is done by economic region and will tie in to the significant independent variables mentioned above (location quotients, urbanization, joint ventures, cooperatives, education, investment, labor and cropland, etc).

a). THE BALTICS:

The seafaring Baltic countries (Latvia, Lithuania, and Estonia) each emerged with two successful commodity exchanges in 1991, followed by another in Lithuania and two more in Latvia in 1992. The average price for broker licenses (March 12, 1992) remains high (Latvia - 425,000 Rub., Lithuania - 540,000 Rub., Estonia 254,000 Rub.), thus a sign of economic health of the exchanges. In Latvia, consolidation of the two largest exchanges

took place (Jan 92), and many of the smaller exchanges have merged into the into the larger ones (Apr 92).

Emergence of these commodities exchanges in the Baltics is no surprise. There are many factors that have facilitated the adoption if market economy initiatives there. First, the people of the Baltics have always had the "business spirit" in the former Soviet Union. Economic experimentation has been the hallmark of the Baltics ever since their forced annexation to the Soviet Union. The first joint venture in the Soviet Union was operating in Estonia before final touches of the Soviet joint venture law were in place (Claudon, Gutner, 1991). Business directories list Estonia as having four, Lithuania three, and Latvia one significant joint ventures. However, Estonian officials claim to have 1,623 registered, fully operational joint ventures (March '92), many of them with nearby Finland. Lithuania claims 1,025 operational joint ventures (April 92). More joint ventures on a per-capita basis are located in the Baltics than any other Republic. More cooperatives on a per capita basis have been formed in the Baltics than any other part of the Soviet Union (4-1-'89 Business cooperative labor: Latvia - 134,800 (11.5%) Lithuania - 81,400 (5.2%); Estonia - 42,100 (6.2%). There are also more individual farms in the Baltics than in any other independent Republic, other than Georgia (Available Cropland: Latvia - 1625 ha.; Lithuania - 2292 ha.; Estonia - 926 ha.). Foreign Trade Associations are also prevalent in the Baltics.

Other clues as to reasons for adoption of commodity exchanges are presence of urban centers and level of education.

The Baltics population remains relatively urban (70.3 %), with their main cities (Riga, Tallinn, Vilnius) being Rudimentary Growth Poles (Medvedkov). Due to high levels of USSR investment per capita (1988: 88.3% of RSFSR level), their infrastructure is much better than neighboring Eastern regions. Their university education level is moderately high at an 70 percent average.

Unfortunately, the Baltics suffer negative trade balances. Though they are highly industrialized, they remain resource poor. The Baltics were once an integral part of the centralized Soviet economy and planning system, with the result that their economies are almost totally dependent on imports of oil, gas, timber, and other raw materials, parts and supplies. The Baltics do export manufactured goods of light industry, timber processing, and electro-technical engineering, but nearly 100% of their requirements for non-ferrous metals, and 90 % of fuel are met by supplies of the Commonwealth of Independent States (CIS). All of this reliance could jeopardize their future business climate. The Baltics will either have to seek to maintain a policy of common economic ties with CIS or adopt a policy of accelerated integration with the West.

The future does look bright for the Baltics. Their ice-free ports, good infrastructure, well-educated, highly skilled work force, easy access by air/sea, and history of trade practices should make them a "gateway" for attracting foreign investment and for a transition into capitalism in the near future (Claudon/Gutner).

b). BELARUS:

Belarus saw the adoption of eight commodity exchanges in the last two years. The Republic's two most significant commodity exchanges emerged in Minsk in 1991, both later merging with other regional exchanges into a single, large exchange in Minsk in 1992. The minimum price per seat for the Minsk exchange on both 10 and 24 December 1991 was a decent 250,000 rubles.

Exchanges developed in Minsk because it is Belarus' dominant growth pole and large urban center. The population of Minsk city (1.6 million) is 4.5 times greater than the main city size of its five peripheral provinces, and Minsk maintains labor trained at 89.3% while the peripheral provinces holds 83.0 % of the trained labor. The university education level in Minsk is twice that of nearby provinces. This would appear then as a classic case of polarization and backwash, but that is only partly true. Each of peripheral provinces (Grodno, Vitebsk, Gomel, and Brest) were also able to initiate commodity exchanges in 1991, with Mogilev initiating two exchanges. Thus, business resilience appeared outside Minsk. Mogilev may have emerged with two exchanges because of a high chemical location quotient that is four times larger than its neighbors. Unfortunately, each of the provincial exchanges dissolved in March 1992, merging with single large exchange in Minsk. In the end, Minsk dominates.

The Republic of Belarus has benefited from important USSR per capita investment (1988, 81.4% of RSFSR), but the business climate there is not at the same level as the nearby Baltics. Overall, the Belarus republic had only 2.8% of its labor in

business cooperatives in 1988, and only 37 registered joint ventures by October 1990 (1.6 % USSR total). The 1991 Business directories list significant joint ventures in Minsk (4), Vitebsk (3), and Mogilev (1). Minsk is the dominate initiator as it has 11 times more cooperatives in foreign trade than peripheries and twice as many foreign trade associations. Minsk's textile LQ of 2.0 and power supply LQ of 2.1 will should help it in business.

The business future for Belarus will include its seemingly political stability (Minsk, capital of CIS), its success in labor productivity in both industry and agriculture, and its status as leading supplier of fertilizers. The Belarus government will, though, have to be able to deal with potential worker strikes, as seen in April with extended coal miner strikes in Solegorsk. On a side note, the government recently stepped in (March 92) to limit the proportion of foreign investment into commodity ex-changes to 25%.

c). MOLDOVA:

Moldova's only exchange appeared in capital Kishinev in 1991. Kishinev (pop. 676,000) is identified as a Rudimentary Growth Pole (Medvedkov), and that is no doubt the reason of exchange development there. However, the exchange appears among the weakest, as seat prices go for only 65,000 rubles.

Moldova received only 59.8 % (of RSFSR) per capita invest-ment in 1989, but it has still managed some business ventures. Five and a half percent of the total available labor in 1988 was working in business cooperatives, and 26 joint ventures (1.1% of total) were registered there by October 1990. Business Guides

list 3 significant joint ventures and one foreign trade associa-
tion in Kishinev, thus reinforcing Kishinev as Moldova's only
"active" business center.

Moldova's lack of more exchanges can be explained by many
reasons; 1) the region is resource poor and less industrialized
than many neighbors, 2) the presence of an unstable domestic
political situation, as both Gagauz and Trans-Dniester regions
call for independence, 3) a previous history of worker strikes,
4) the fact that Moldova is not an urban province like its
neighbors (47%), and 5) a university education index of 52, much
lower than its neighbors.

Moldova's business future is foggy. It will have to include
its export of light and food industry products, but its lack of
power sources and reliance on crude oil imports make it at the
mercy of its neighbors. The country is currently in an economic
crisis (industrial recession 7.9%), lacking the cash to pay wages
even as recently as April. Worst of all is the ongoing fighting
in the Trans-Dniester region. President Snegur's order in June
to send his government troops there resulted in the massacre of
200 uprising locals in the town Bendery. These unsettled aggres-
sions will slow income of western investment and movements to a
market economy.

d). SOUTH-WEST UKRAINE:

Five commodity exchanges emerged in South-West Ukraine in
1991 and 4 more in 1992. The average price per seat on Kiev ex-
changes was a low 190,000 rubles on 24 December, 1991.

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Exchange growth in South-West Ukraine follows the classic case of the growth pole theory. Kiev, the Ukraine capital and Dominant Growth Pole (pop 2.62 million), adopted 3 exchanges in 1991 and 3 more in 1992. The main city size of Kiev province is 8.8 times larger than the average of the 12 peripheral provinces. Kiev holds labor trained at a rate of 91.6 %, compared to 84.7% in the attached periphery. Percentage of land for crops in Kiev province is 70%, compared to a peripheral average of 46.6%. University education level is also higher in Kiev with an index of 125, compared to peripheral average of 45.2. Kiev also holds 4 of the 8 significant S.W. Ukraine joint ventures, and 7 of the 12 region's Foreign Trade Associations. Lastly, Kiev has 14.8 times more cooperatives engaging in foreign trade than the peripheral average, and maintains high location quotients in electronics (3.1), and transport and communications (1.5) that should enable it to compete at the market level.

But Kiev is not alone exchange growth. The western and neighboring provinces of Ivano-Frankovsk and Zakarpatskaya each adopted exchanges in 1991, as did Chernovtsy in 1992. Possible explanations for exchange growth there are previous market reform innovations and higher location quotients (LQ). Zakarpatskaya holds 2 significant joint ventures, a foreign trade association, and an Electronics LQ of 3.0. Ivano-Frank's chemical LQ of 2.05 ranks highest in S.W. Ukraine. Chernovtsy maintains a high primacy rate of 8.0.

The business future of the region is moderate. The region is both resource poor and less industrialized than many other re-

gions. The exchanges in Kiev appear weak, as evidenced by a low
price per seat. Kiev, under President Kravchuk, will have to
deal with its own Ukrainian problems first before fast tracking
to a market economy. The Zakarpatskaya and Crimean regions are
calling for independence (June), and the whole of the Ukraine's
coal industry is in shambles. The Ukraine is reaching out,
though, as they signed in March a $ 7 billion deal with Iran for
oil and gas. Another contract with AT&T communications company
(Jan 92) will update all of the phone lines in Kiev, followed by
the country. As for the outer regional exchanges, only time will
tell if they will be able to survive.

e). SOUTH UKRAINE:

Two exchanges have been adopted in the South Ukraine, both
of them in Odessa. Explanation for adoption in Odessa is simple.
Odessa has the best port access to the Black Sea and is a domi-
nant growth pole with a city size of 1.1 million. Odessa is 2.7
times larger than the average city size of its neighboring three
provinces. Odessa province holds 66 % of its land dedicated to
crops, compared to a attached peripheral average of 48.1%. The
South Ukraine's only significant joint ventures are in Odessa
(3), as are its only foreign trade associations (2).

The South Ukraine, though is both resource poor and less
industrialized than many regions. Only Odessa appears to be
able to initiate business ventures in the region. Odessa's high
transport and communications LQ of 2.74, power supply LQ of 2.24,
and university education index of 83 (regional average 67.3)
should make it the dominant business center of the South Ukraine.

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f). DONETSK-DNEPR:

Six exchanges developed in Donetsk-Dnepr region in 1991; two in Dnepropetrovsk and Kharkov, and one in Donetsk and Voroshilov-grad. The cost of a seat on one of the Dnepropetrovsk exchanges was a very high 660,000 rubles.

Adoption of exchanges is again attracted to growth poles. Kharkov is a dominant growth pole, with a city size of 1.61 million and labor trained at 93.0 %. Kharkov province has 63% of its land used for crops, compared to an attached peripheral average of 54.6%. Its education level index is high at 97 and it maintains transport and communications LQ of 2.0. Dnepropetrovsk and Donetsk are both rudimentary growth poles, with populations of 1.18 and 1.11 million, respectively. Both cities have mining as their focus (LQ's 2.6 and 4.7), with Donetsk also being an important railroad center. Four significant joint ventures were identified in Donetsk. The city of Voroshilovgrad is also a significant mining center (LQ 7.2).

Much of the future business climate in the Donets-Dnepr region does not look attractive. The region's lifelung, coal from the Donets-basin, has played a decreasing role in percentage total USSR Soviet energy production over the last 25 years. Oil, natural gas, and chemical industries (in Russia) now replace the once dominant coal and steel industries. Because of reduced investment, Ukraine's coal mines are the oldest in the former USSR with 70% of them not having been updated in over 20 years. Consequently, depression in Donetsk-Dnepr is resulting from slumps in output and unemployment. Massive coal miner strikes in

the region in 1989 raise the question of the economic stability of the region. All of this helps to explain the larger share of exchanges in Russia than the Ukraine. More investments have gone to Russia for oil, and gas, and a decreasing investment share per capita has gone to the Ukraine (1988, 62.5% of RSFSR) for its coal.

g). CENTRAL:

The Central region of the Russian Republic is entirely dominated by the city of Moscow which adopted a record 23 commodity exchanges in 1991, and 13 more in 1992. Moscow alone leads all economic regions in total number of exchanges. Furthermore, only one other Center province, Yaroslavl, was able to initiate single commodity exchange. The average price per seat in Moscow is the highest in the former USSR at 2,628,000 rubles (Dec 24, 1991).

Moscow, the capital, is the sole leader in many ways. It is a dominant growth pole with a population of 9.0 million, some 20.9 times greater than the peripheral city average. It holds labor trained at 97.7, compared to 91.3% in the provinces. Moscow province uses 65 % of its land for crops, compared to a low attached peripheral average of 29.5%. Moscow also possesses 83 of the region's 87 significant joint ventures (50.5% total CIS), 124 of the region's 129 foreign trade associations, and had 80 % of the cooperatives engaging in foreign trade. The Moscow oblast alone received 8.09 % of the 1989 State share of the RSFSR budget, while the periphery average was 0.71%. The education level index of Moscow is 152, compared to the regional average of

47.2. All of this leads to the another classic case of a center (Moscow) with a periphery of backwash and decay (Medvedkov). The periphery may be forever in decay, all the more hurt with the decrease in coal demand from the fringe Podmoskovny coal basin (Tver, Smolensk, Kaluga, Tula, Ryazan).

Some of the exchanges in Moscow are strong because they deal in power resources (oil, timber, grain). However, recent tough Russian parliament regulations (Dec 1991, Feb, April 1992) on commodities exchanges is taking its toll on Moscow exchanges (70% decline oil trading, Jan - Apr '92). New and stricter Russian Federation government regulations on the export of power resources is forcing many exchanges to consolidate. The top three Russian oil exchanges (Moscow Oil, Tyumen Commodity, Nizhnevartovsk Oil) announced close cooperation in May 1992.

The future of the business climate for the Center region will most certainly revolve around Moscow. Moscow, the seat of government, has the highly skilled labor (engineering, electronics) and research institutions necessary for new, sophisticated branches of industry. Moscow has also traditionally held the edge in attracting investors (Claudon, Gutner) because of its capital status. It will probably remain the mecca for many foreign companies that feel economic decision-making in Russia is and will remain government influenced, as seen above with exchanges.

Moscow is making its preparations, as evidenced by a recent a large contract with AT&T (Feb '92), to update its lagging working communication systems.

h). THE NORTH:

The North economic region saw the adoption of 4 commodity exchanges, one in Karelian ASSR, Komi ASSR and Murmansk in 1991, and another in Murmansk in 1992. Though the prices per seat at the 1991 Murmansk exchange was a respectable 250,000 rubles, the importance of any significant exchange, excluding Murmansk, operating in the North region is questionable.

Reasons for exchange adoption in this region are comprehensible. Murmansk province has sea access, is 92 % urban, educated at an index of 95, and with LQ's of 4.4 in mining and 4.6 in chemicals. Four significant joint ventures and a foreign trade association are operating in Murmansk. Komi ASSR, on the other hand, benefited from a large 5.14% share of the RSFSR budget in 1989, has a mining LQ of 5.9 (large natural gas production area) and chemical LQ of 2.1, but like neighboring Karelian ASSR the province is susceptible to instabilities. Coal worker strikes in there in 1989, and recent strikes by coal miners, teachers, and transport workers in Vorkuta in March of this year make the region unstead>.

The main drawback, though, of this region's business future is its very northern, "icy" location. The average mean city size of the region's five provinces remains low at 337,200, and the region has no growth pole, be it dominant or rudimentary.   The North may be required to get outside help to develop its natural resources. There is hope as a "potential" super gas deposit was located in March 1992 on the Barents Sea, 650 km from Murmansk, which could yield $10 - 100 billion in profits.

i). THE NORTHWEST:

Six exchanges grew in the Northwest region in 1991, five in St. Petersburg and one in Novgorod. Two more exchanges followed in St. Petersburg in 1992. The average price per seat was a strong 350,000 rubles.

Exchange growth in St. Petersburg is easily explained. St. Petersburg is a dominant growth pole, with a city population of 5.04 million and labor trained at a 97.8% rate, a rate far higher than the 84.1% trained labor of the nearby regions of the Baltics, North-East, and North. The province maintains 36 % of its land for crops, compared to an attached peripheral average of 10%. The city and oblast have benefited from a 3.87% share of the RSFSR budget in 1989. By October 1990, St. Petersburg claimed 9.4% (177) of the total registered joint ventures in the USSR. Ninety of the 96 region's state enterprises engaging in foreign trade are in St. Petersburg, as are 91 % of all the region's cooperatives engaging in foreign trade. Its high LQ in electronics (2.5), and education level index (122) have also contributed in enabling it to engage in market reform initiatives.

Not is all golden, though, in this northern "Window to the West". In a city where heavy industry dominates, slumps in output has led to rising unemployment and crime. City pollution is rampant. But the challenge lies ahead. The future for St. Petersburg will have to include its highly skilled labor force, its port, rail terminal center, research facilities, and access to nearby Finland. If a business center can develop tied in to

its historic culture (art, books, theaters), much like New York City, then it could be all the better for the city. The city is moving in the right direction - a recent joint venture (Feb 1992) has led the American AT & T telecommunications company to set up their Russian headquarters in St. Petersburg.

j). CENTRAL CHERNOZEM:

Only two exchanges emerged in this region, both in Voronezh in 1992. Voronezh, with a population of 895,000, is neither a rudimentary or dominant growth pole. But its initiative into market reform (exchanges) probably stems from a combination of other circumstances; it has the region's highest LQ power supply (3.9), highest education index (63, compared to regional average 46), a city population twice that of its neighbors, 75 % of the region's cooperatives engaging in foreign trade, and one of the region's two foreign trade associations. Voronezh is a city of restricted growth, but with significant cultural developments.

The business climate here will be hazy - the region has no real resources, is not very industrialized, and contains no growth pole to revolve around.

k). VOLGA-VYATKA:

It is not surprising that only two exchanges have emerged so far in this region, one in Nizhny-Novgorod (Gorky) and the other in Kirov. The sole exchange in N.- Novgorod has a price per seat of 350,000 rubles (Dec 24, 1991).

Nizhny-Novgorod is a dominant growth pole with a population

of 1.44 million, 3.9 times larger than the average main city size of the peripheral provinces. The province maintains 44 % of its total land dedicated to crops, compared to 29.2% for the periphery, and the province received 1.96% of the 1989 RSFSR budget, while peripheral region average was only 0.52%. Its machine-building LQ is 2.5. On the other hand, Kirov is a smaller city of 487,000, but possesses a larger percentage of people working in cooperatives than larger N. -Novgorod.

The "business initiative" in the Volga-Vyatka appears weak. It remains both resource poor and less industrialized than many other regions. It is still plowing in steel and machine-building, and lacks an infrastructure contusive to business. The large urban center of N.-Novgorod claims only two significant joint ventures, one foreign trade association, and one commodity exchange. Its low education level index of 52 may contribute to the problem. The region is hampered by the fact its two main cities, N.-Novgorod and Kirov, have no real significant growth or cultural developments.

1). VOLGA (POVOLZHYE):

The Volga region saw 6 commodity exchanges appear in 1991, two in Kazan (Tatar), and one in Ul'yanovsk, Vologograd, Samara (Kuybyshev), and Penza. Another exchange emerged in Kazan in 1992. The December 1991 price per seat in Samara was lofty 750,000 rubles, and in Volgograd, 500,000 rubles.

The appearance of 3 commodity exchanges in the rudimentary growth pole of Kazan (Tatar) is a sign of its growing business

importance. Growth of exchanges there can be explained by the existence of past substantial oil production requiring a high share of 1989 RSFSR budget (2.33%, 0.52% more than larger city Samara). Kazan is a relatively large urban center (pop 1.1 million) with an ever growing population. Much of the attraction will remain the expanding oil and chemical industries along the Kama and Volga rivers, as well as the emergence of new metals and machine building manufacturing enterprises. More significant joint ventures are located in Kazan than in larger Samara. A recent plan (June 92) by the Republic to start the production of its own production of fuel has taken the interest of many Western nations. The only drawback to the Republic's future business activity could be the growing national separatism against the Russian Federation.

Samara also holds a significant exchange (avg seat price 750,000 rub) because of it is a dominant growth pole (city pop 1.26 million) and large oil production center, as well as site of a huge hydroelectric plant. It maintains 63% of its land for crops, compared to a peripheral average of 46.7%. Its education index is the highest in the province, and it is undergoing significant cultural developments.

Ulyanovsk is a rudimentary growth pole, leading its periphery in consumption per capita. The remaining peripheral provinces have suffered the effects of backwash, the survival of their exchanges is questionable.

m). NORTH CAUCASUS:

The North Caucasus saw the adoption of five exchanges in

1991, three in Krasnodar and two in Rostov. Two more exchanges emerged in Stavropol in 1992. The average seat price on the Krasnodar exchange in 1991 was a high 600,000 rubles.

The compelling information here is the adoption of three strong exchanges in Krasnodar (pop. 629,000) and two exchanges in Stavropol (pop. 324,000), while larger Rostov (pop 1.03 million) only claimed two exchanges. The situation can be partially explained by larger state investments in Krasnodar (1.87%) and Stavropol (1.47%) than Rostov (1.79%), specifically targeted at natural gas production. Availability of natural gas beyond state targets may have led to the growth of exchanges in Krasnodar and Stavropol.

Krasnodar is a rudimentary growth pole, with no growth but with significant cultural developments. It claims two of the region's three foreign trade associations, an half of the region's significant joint ventures - two other possible explanations for its ability to adopt market initiatives.

Stavropol is also a rudimentary growth pole, leading its periphery in consumption per capita. It is a city on the rise, in growth in cultural developments, and with rural vitality (O. Medvedkov).

The future business activity in the region will be highly affected by the fact the region is mainly resource poor and less industrialized than other regions.

n). URAL:

The Ural region had by May 1992 the third largest number of

exchanges (21) by economic region of the former USSR. Nine ex-
changes were registered in Ekaterinburg (Sverdlovsk), followed
by five in Perm, three in Chelyabinsk and two in Udmurt, and one
in Bashkir and Orenburg.

The relative importance of some of these numerous exchanges
is debatable for two reasons. First, the average price per seat
of the region's six most significant exchanges in December 1991
was only 141,000 rubles. And second, the vast majority of these
exchanges deal in the state's vital resource, oil, which after
recent laws on exchanges may force many "smaller" exchanges to
consolidate. The future will probably see a few, solid exchanges
in the region, particularly in Ekaterinburg.

The numerous growth of exchanges in the region is easily ex-
plained by heavy RSFSR State investment(R Sq = 0.56, see Figures
8.1) into the region's oil and natural gas resources. The Ural
region has always been choked for natural resources, beginning
with 1920 Soviet industrialization plans to deplete the region of
its iron and steel. The later economic shift from coal and steel
to oil and natural gas has left the region's steel mills totally
environmentally disintegrated, especially in Chelyabinsk. Be-
cause of the pollution, and threat of coal miner strikes, the
future success of Chelyabinsk business activity is questionable.
The recent poor results of its investment and television ex-
changes are signs of trouble for the region.

On the other hand, Ekaterinburg, the dominant growth pole
with population 1.37 million, appears more successful with its
nine exchanges - mostly due to deals in oil, gas, and steel. It

hold two-thirds of the region's significant joint ventures. Moreover, Ekaterinburg is also the former power base of Russian President Yeltsin, which may help explain the high number of exchanges there (Corbin). Also, U.S. companies plan to invest $1 billion in the region for the conversion of its defense industry (May 1992). The city, though, needs help as evidenced by the 8 million Deutche Marks worth of humanitarian aid it received in April.

The other exchanges in the region are probably also ex-plained by state investment into oil production (Perm, Udmurt) and natural gas production (Orenburg).

o). W. SIBERIA:

The Western Siberia economic region is the single most important source of hard currency exports in the former Soviet Union - thanks in all to large amounts of natural energy re-sources and raw materials. Because of this, we find a total of 22 exchanges in the region, the second highest number of all economic regions. Exchanges here are much stronger than nearby Urals with average seat price for seven exchanges in December 1991 of 422,000 rubles.

Exchanges are clustered in three different areas of the re-gion. In the western region, near the oil-producing Ural econom-ic region, lies oil and gas-producing Tyumen oblast and its 10 exchanges. In the center lies the oil-refining city of Omsk with 3 exchanges. And, on the eastern regional end, near the Kuzbass coal field, are clustered Kemerovo with its 5 exchanges, and Novosibirsk with 2, and Barnaul with one.

Oil and gas have traditionally been the most significant source of hard currency for the former USSR. Russia plays the same role on the world gas market as Saudi Arabia on the world oil market. Curiously, the oil and gas industries have always been considered inefficient because of state fixed prices, whereby all money earned by the industries was ploughed into the budget, a portion of which the government subsequently distributed. Consequently, because of the appearance of inefficiency, Moscow has let its West Siberian oil fields get run down by decades of underinvestment in equipment. The result has been a decline in the sector - 1988 (414 million tons of oil) to 1990 (375 million tons), and to 1991 (325 million tons). The tendency will probably continue for 1992.

Despite the oil decline, commodity exchanges in West Siberia have grown in number. There are several explanations for the huge proliferation of exchanges, which include 1) state investments in oil and natural gas production, 2) increased regional decentralization, and 3) the presence of uniform commodities. First, despite the appearance of declined investment, the Tyumen Oblast alone received the largest share of the 1989 RSFSR budget with 14.33%. Consequently, the large share of investment provided the foundation for the emergence of 10 exchanges in Tyumen Oblast in 1991 and 1992 (RSq 0.62, see Figure 8.3). Second, the central government's promotion of foreign trade activity in the region through decentralization and regionalization, combined with the partial reduction long-standing economic ties, encouraged enterprises in the oil industry to get the level of the

state orders reduced, giving them increased flexibility in the disposition of oil independent of the central procurement apparatus (Soviet Geography, Oct '91). Thus, the crude oil production associations as well as refineries turned to commodity exchanges to swap oil for needed supplies. Faced with a strike threat in April 1992, the government allowed oil enterprises to sell 40% of the oil they produce on the country's fledging free market. And third, by virtue of its economic nature (trade in qualitatively uniform commodities of oil, gas, coal) and lack of progress in industry, construction, and agriculture in the region, numerous commodity exchanges have emerged to try to quickly turnover the accumulated reserves of uniform commodities and materials (Studies on Soviet Economic Development, 1992).

Unfortunately, the freedom of the W. Siberian oil and gas commodity markets has been curtailed. As mentioned earlier, the April 1992 draft resolution of the Russian Federation's government on the state regulation of resource power prices has become the major factor adversely affecting business activity in the oil and gas sector of exchange trade. In turn, oil and natural gas exchanges are consolidating. The future for potential oil and natural gas sales on the West Siberian exchanges will rest upon what local oil and gas production associations have available in production above new mandated state orders.

The future of the economic region will depend on the state of the Russian energy sector and level of legislation affecting foreign investment. With declined investment, there will be a need for joint ventures to actually produce oil. Proliferation

of general joint ventures is being encouraged through a June 1992 Russian Federation draft resolution which exempts paying taxes on profits for two years for those joint ventures registered after 1 Jan 1992. But a host of other oil-related political and legislative obstacles still stand in the way of large scale investment. The absence of comprehensive taxation legislation and of precise rules on production-sharing has contributed to the challenge of doing business in Russia's oil industry (Ustinov).

The above legislation is causing the failure of a significant joint venture between Russia's Varyoganneftegaz and U.S.'s Anglo-Suisse company to develop oil and natural gas in Tarko Sale and Roduzhny. As of March 1992, the combined $80 million investment has led to a $ 0.5 million return. The Russian Federation therefore needs to reduce legislation to encourage high foreign investment in West Siberia. The region is a key source of export revenue for the Russian Federation and source of profit for western multinationals (Soviet Geography, June 1991).

As for the Kuzbass basin exchanges, it remains to be seen if coal can support them in their business ventures. The growth pole of Kemerovo has high rail density which could benefit the region. More distant Omsk is one of the world's largest oil refineries. Omsk has received western interest to create a large electric plant and to convert its local defense industry (May 1992).

p). EAST SIBERIA:

Unlike its western neighbor, the East Siberia Economic

Region claims only 6 exchanges, two in Irkutsk, two in Chita, and one in Krasnoyarsk and Angarsk. Location of these exchanges is predominantly tied to the Kuzbass coal extraction area. The region is resource-rich, but lacks the oil of its neighboring western region. The region also never underwent the industrialization of the ex-Soviet eastern Europe.

Kransnoyarsk province, with the region's largest city (pop. 922,000), received a high 3.13% of the RSFSR budget in 1989. Despite the coal-related investment, the province has only one exchange to display. The metals and machine-building city of Krasnoyarsk has no real growth and no significant cultural developments - its future business abilities will be constrained.

On the other hand, the territorial complex of Irkutsk saw the rise of two exchanges, this despite being a smaller city (635,000) and receiving less state investment by Oblast (2.12%) than Krasnoyarsk. It has significant cultural developments, and appears to have taken lead, with neighboring Angarsk's exchange, in the region's business initiatives. Time will tell if regional separatism in the area affects its business activity. Chita, with its railroad center and regional coal and iron ore, has surfaced with two exchanges, this despite being a city of only 372,000 people.

Success of the region's market initiatives may revolve on foreign involvement (joint ventures). Because of the Federation's ongoing reduction in coal investments, joint ventures will be needed to expand E. Siberian industries. There are signs of hope for potential oil and gas reserves in the region.

Two significant joint ventures were formed with western and Japanese companies (Jan 92) to explore and develop oil and gas reserves in the Krasnoyarsk and Sakha regions.

q). FAR EAST:

There are a total of 7 exchanges in the vast Far East, two in Magadan, Sakhalin, and Primorskiy (Vladivostok), and one in Khabarovsk. The average price per seat on 4 exchanges in December 1991 was a low 185,556 rubles.

Like its neighbor, East Siberia, the Far East Economic Region has taken a back seat to West Siberia in terms of state investment. The region's vast enormity, harsh physical conditions, and extreme transport distance from the center have precluded it from being developed as a complete industrial base (Cole). However, it is a huge resource-rich region with gold, industrial diamonds, and oil, natural gas, and coal reserves. Much has yet to be developed.

At this point, the significance of the region's exchanges is questionable because of the low average price per seat. All of the exchanges, except Khabarovsk, have grown in small cities, none of which are growth poles, therefore they lack the proper infrastructure. Only the Vladivostok exchanges, main site of the Navy, shows promise.

The future looks bright for the Far East region because of its rich natural resources. Much of the region's achievement will depend on foreign trade and joint ventures with nearby-wealthy Japan and other Pacific rim nations. There are positive indications - of the 12 Free Economic Zones in Russia, only the

zone centered at Nakhodka port has aroused foreign interest. In all, fifty percent of the region's joint ventures are located around Nakhodka. A major joint venture (Aug 1991) with two Japanese companies was concluded to raise coal output through the Nakhodka port, as well as improve the Kuznetsk mine, and study Sakhalin to develop coal. Maybe business could be stronger in the Far East if Russia decided to return the Kuril Islands to Japan.

r). TRANSCAUCASUS:

Five exchanges have emerged by mid-1992 in the rugged and warm Transcaucasus Economic Region; three in Azerbaijan (Baku), and one in Georgia (Tbilisi) and Armenia (Yerevan). Success of these exchanges, and business ventures altogether, will probably be highly dependent on the continuation of inter-Republican trade and government stability.

The Transcaucasus have received below average investment levels over the years. Their 1988 investment share averaged only 57 % of the RSFSR share. Consequently, their living standards are below the norm. The resultant lack of any growth poles, lack of resources (very limited oil, coal, natural gas), and low industrialization levels has made the exchange of goods between Republics vitally important for the survival of the region and survival of the exchanges.

A large handicap to market economy transfer remains the continued political instabilities in the region. Georgia's presidential turmoil and ongoing armed conflict with South Osse-

tia (June 92), as well as the continued Armenia/Azerbaijan battle over Nagorny-Karabakh and Nakichevan are not smart for a capitalist transition. Azerbaijan (Baku) was struck with violence over the resignation of President Mutabilov in May. Other troubles for market initiatives are the black markets in the region which continue to threaten the existence of commodity exchanges (Corbin).

Nevertheless, Azerbaijan (Baku) appears to have taken the lead in the exchange movement in the Transcaucasus. Its' three exchanges are located in Baku, the Republic's capital and largest city (pop. 1.78 million). Adoption of exchanges in Azerbaijan can be explained by its large city size, more cropland than Georgia and Armenia combined (though much agriculture is ruined), an oil and gas presence, and possession of three of the region's six significant joint ventures. Azerbaijan is more receptive to Western investment than many of its neighbors, and it continues to maintain a close relationship with Russia. The democratic election of President Elchibei in July is a step in the right direction for business. Of the three Transcaucasus republics, Azerbaijan will be better off as it is sustaining a trade surplus, and nas reached out to nearby Turkey and Iran for business ties (Jan 1992). Only a full scale war with Armenia can slow the movement down.

Growth of Armenia's and Georgia's exchanges may have been stimulated by a high percent of labor in cooperatives (10.6%, 6.3%) in 1988, as well as the presence of its two urban centers, Yerevan and Tbilisi (pop. 1.20 and 1.28 million). Armenia holds

a very high education index at 91, and Georgia has seen gains in net population migration because of food abundance and a comfortable climate. Both Armenia and Georgia, though, will continue to be dependent on inter-Republican supplies as little or no fuel exists in Armenia and Georgia, and Georgia's range of exports is extremely narrow (Frantseva). There are only a couple of joint ventures in Georgia and Armenia. What is most dangerous for business there are the continued political instabilities of Georgia (Shevardnadze and Ossetia) and fighting between Armenia and Azerbaijan.

s). KAZAKHSTAN:

Kazakhstan has adopted a strong nine commodity exchanges over the last two years, three in Alma Ata (1991: 2, 1992: 1), three in Karaganda (1991: 2, 1992: 1), two in Guryev (1991: 1, 1992: 1), and one in Kustanay in 1992. The exchanges are respectable as the regional average for seat prices on six exchanges in December 1991 was 609,000 rubles.

Kazakhstan has benefited from moderately strong investment (1976 - 1988: 87% per capita of RSFSR) directed to its coal, metals, and oil fields, as well as its nuclear arsenal. It is the most developed republic in the region. Much of the investment, unfortunately, has led to vast pollution, and ruination of its agriculture.

Adoption of exchanges in Alma Ata is explained by its status as Kazakh capital, and Republic's sole rudimentary growth pole of 1.15 million people. It leads its periphery in education, consumption per capita, and number of significant joint ventures.

Most important, Alma-Ata, is the seat of a very stable, United Nations-recognized government led by President Nazarbayev. Alma-Ata's has also shown diplomatic vigor - it was visited by 12 official international delegations between January and March 1992, mostly to resolve issues of nuclear weapons.

Karaganda, on the other hand, has not always been so stable. Its three exchanges lie over the former Soviet Union's second largest coal-producing basin - also the site of massive coal miner strikes in 1989. Since it has no real growth and no development, success of exchanges in Karaganda will indirectly relate to the demand for coal, and future need for iron and steel. On the other hand, Guryev's oil and gas exchanges and Kustanay's exchange can survive if they receive western help and possibly begin trading oil outside the former Soviet Union.

Overall, the market economy outlook for Kazakhstan looks excellent. Their vast oil, coal and natural gas reserves has led to an unprecedented activity in establishing foreign contacts. A full scale project with Chevron Oil (May 92) to develop the Tenghiz oil field could net the country an estimated $27 billion. Another huge project with Rotchild Bank (June 92) to develop the deposits of precious metals and minerals could also net a small fortune. Also, one must not forget it is host to the region's main space launch site. It remains to be seen, though, how future business will be affected by the state becoming another Turkic state, like neighbors Uzbekistan and Kyrgyzstan, or an Islamic state closely linked to its neighbors, the Middle East and south east Asia.

t). CENTRAL ASIA:

Central Asia claims a total of seven commodity exchanges, but their potential is about the lowest of all regions (discussion below). Kirghizia (Frunze) holds three exchanges, Tajikistan (Dushanabe) has two exchanges, Uzbekistan (Tashkent) one, and Turkmenia (Ashkhabad) also one.

Central Asia is the "tragic experiment" of the former Soviet Union because central planners for years treated the region as expendable for the glory of the Soviet economy. Industrialization of the region was uneven at best, without any long term strategy (Rumer). The only real plan for the region was for it to become the cotton base of the USSR. Even as recently as 1988, the Central Asian Republics received the lowest investment shares per capita than any region. Consequently, their standard of living and quality of life are by far the lowest in the former USSR. Because of the region's backwardness, only 3.7% of the labor joined the cooperative movement in 1988.

Uzbekistan, the largest of the Central Asian republics, claims only one exchange in Tashkent. Tashkent, the Republic's capital and dominant growth pole, holds a population of 2.1 million people. After years of concentrated central investment, the capital became the largest construction base in the USSR, and remains also the site of Central Asia's greatest industrial plant (Rumer).

Why then are there no more exchanges in the Uzbeki Republic? Uzbekistans's only industry is cotton (65% Republic gross output)

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which makes it reliant on imports of all categories, including oil and gas (Rumer). Its natural resources are underdeveloped, and it claims only two significant joint ventures. The Republic is trying to reach out, though, with its initiation of a law on foreign investment (June 92) which provides favorable taxation for foreign investors. A significant joint venture was formed in March 1992 with a U.S. mining company to produce gold from the Muruntau mine for export. The government also claims its Mingbulak oil deposits to be one of the world's ten largest. The business reform measures, though, will be slow because of the government's conservative stance.

Kirghizia's three exchanges in Frunze may have risen from the Republic's particular active implementation of democratic changes which encourage market initiatives (privatisation). Frunze, the capital, is a moderately large sized, non-growth pole city of 625,000. It has restricted growth, but significant cultural developments. Adaptability of Kirghizia's exchanges will be difficult - Kirghizia is at the mercy of inter-republican trade - it imports coal, machines, chemical products, and light industry. Its only significant export is electric power. The country must also deal with its "black market". Unfortunately, the Republic has no significant joint ventures; western investment has turned the eye away for now.

Tajikistan's two exchanges emerged in the Dushanabe, the Republic's capital of 602,000 people. The emergence of exchanges may be due to the fact Dushanabe has significant population growth and cultural developments, and to some of the Republic's

exports of non-ferrous metals, and oil and gas industry products. But, these exchanges cannot be taken seriously. The Republic's deposits of oil, gas and coal are insufficient to meet the demands of its people - extractions are dwindling. Only one railroad connects Tajikistan to Europe, and the whole transport system is poor. The republic has no growth poles or no significant joint ventures. Worst of all, as of July 1992, the nation is on the brink of civil war. Tension in the Kuylab province between pro and anti-government factions has led to over 100 deaths. Conservative President Rakhmon Nabiyev sent his troops from Dushanabe to settle the situation. These internal power crises and lack of resources will prevent the progression of market initiatives and foreign investment.

Turkmenistan's sole exchange in capital Ashkhabad (pop. 407,000) may have risen from the Republic being the second largest natural gas extraction (10% CIS) site in the former Soviet Union. The future of its exchange and business activity altogether will depend on the level of government reforms to encourage market initiatives and western investment. The recent landslide election (95% vote) by conservative President S. Niyazov in June shows phenomenal stability for the region, but progression of democratic reforms may continue to be slow. The region is in need of outside help; it is too reliant on inter-republican trade. It has no growth poles, no joint ventures, and no foreign trade associations. Its only hope is to expand its large natural gas potential - companies British Petroleum and British Gas have shown interest (March 92) in developing the nation's numerous

natural gas deposits in the Karakum Desert.

X). CONCLUSION:

Through the thorough examination of market-oriented initia-
tives in the former Soviet Union, we have exposed the regional
inequalities caused by the Soviet legacy of industrialization.
The Soviet legacy saw the central management funnel vast amounts
of investments into large industrial giants, at the expense of
tributary regions. Consequently, the labor and infrastructure of
the peripheries declined in the name of national growth poles.

The backwash felt by the periphery regions and outer Repub-
lics is evident today in a broken Soviet Union. Their inability
to adopt sufficient market-oriented reforms is a clear sign of
handicap. The early study on joint ventures, cooperatives, and
foreign trade associations pointed to the majority of adoptions
in European-core provinces led by Dominant Growth Poles, and not
in the peripheral regions and Republics led by small provincial
cities.

The analysis of the diffusion of recent commodity exchanges
further confirms the attraction of market-oriented reforms to-
wards urban growth poles. The increased clustering of exchanges
towards Moscow, St. Petersburg, and other Russian oil and gas-
producing centers is evident. The reasons for the adoptions in
these regions all relate to the growth pole theory. High state
investments into existing industrial, oil, and gas centers at-
tracted the labor, infrastructure, cropland, education establish-

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ments, and eventual surplus commodities necessary for the creation of exchanges. Regions lacking these characteristics rank low on exchange adoption. Furthermore, the breakup of the Union has provoked political instabilities, contributing to both a low exchange adoption and low future business potential.

The future of many of the exchanges in Russia is in jeopardy because of recent restrictive regulations on the exchange of the Federation's vital resources. This is causing the consolidation and closures of many exchanges. Despite the closures, some regions should have the advantage of being able to adapt to changes and begin new business ventures.

The future regional business potential again points to regional inequality. The well-linked European Russian urban centers and the Baltics should have the highest potential for business activities and for attracting foreign investment because of existing skilled labor and infrastructure. Western Siberia has high potential with its oil and natural gas reserves, but Federation-driven legislative obstacles continues to stand in the way of doing solid business in Russia' oil industry. The Ukraine's reliance on coal for business activity is not enough; it will need foreign investment. The potential of the Trans-Caucasus will only be increased with political stability and continuation of inter-republican trade. Central Asia, after decades of neglect, will also need internal stabilization and massive outside aid in order to transfer to a market economy. East Siberia and the Far East, both rich in natural resources, as well need to look east for foreign investment.

Economic Regions of the former USSR

BALTICS
N.WEST
NORTH
B.ARUS
S.WEST
MOLD
CENTRAL
CENT.
SOUTH
CHRNZ.
VYATKA
WEST
SIBERIA
EAST
SIBERIA
FAR EAST
DON.
DNPR
URAL
VOLGA
N.
CAUCASUS
TRANS
CAUCASUS
KAZAKHSTAN
CENTRAL
ASIA
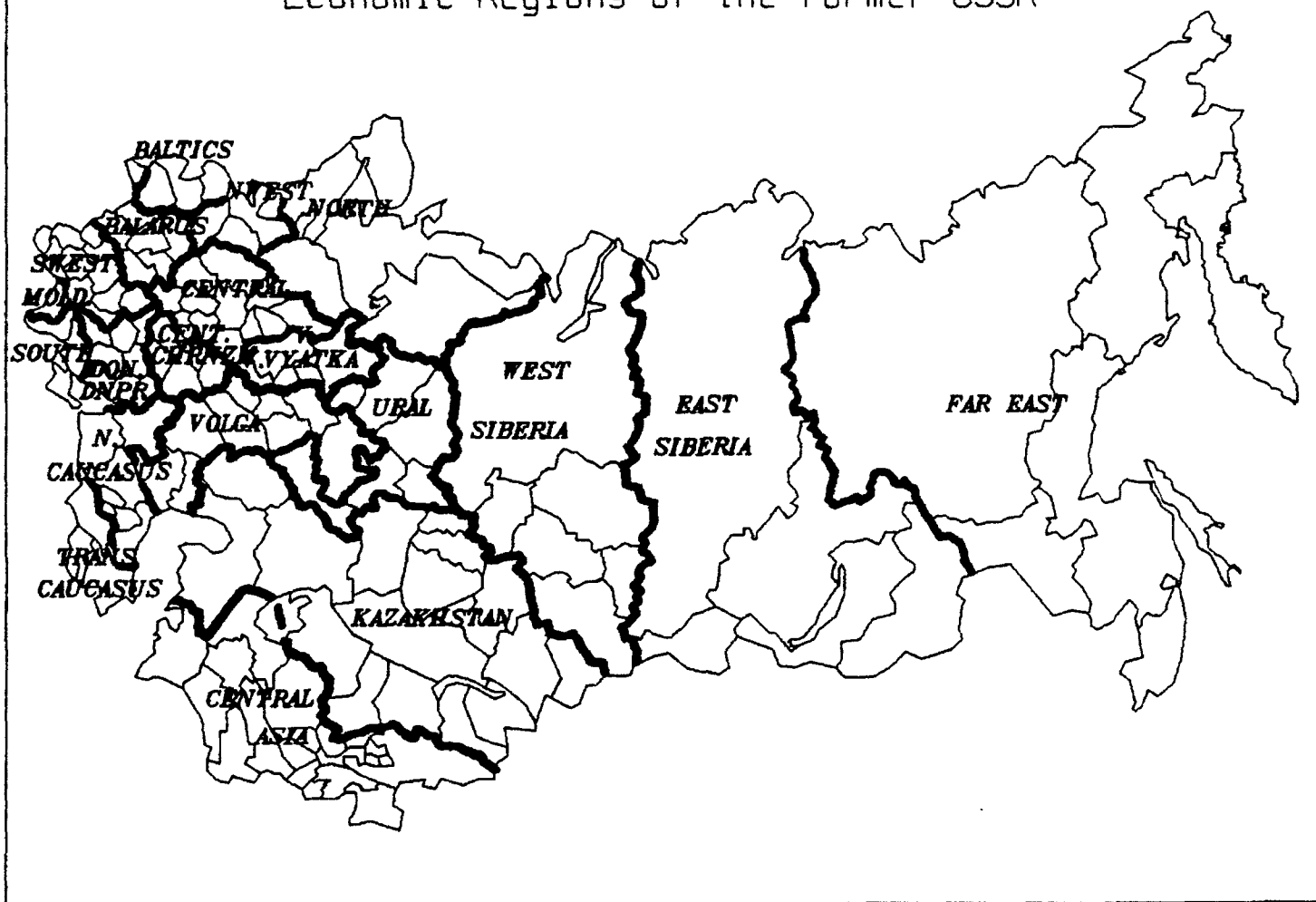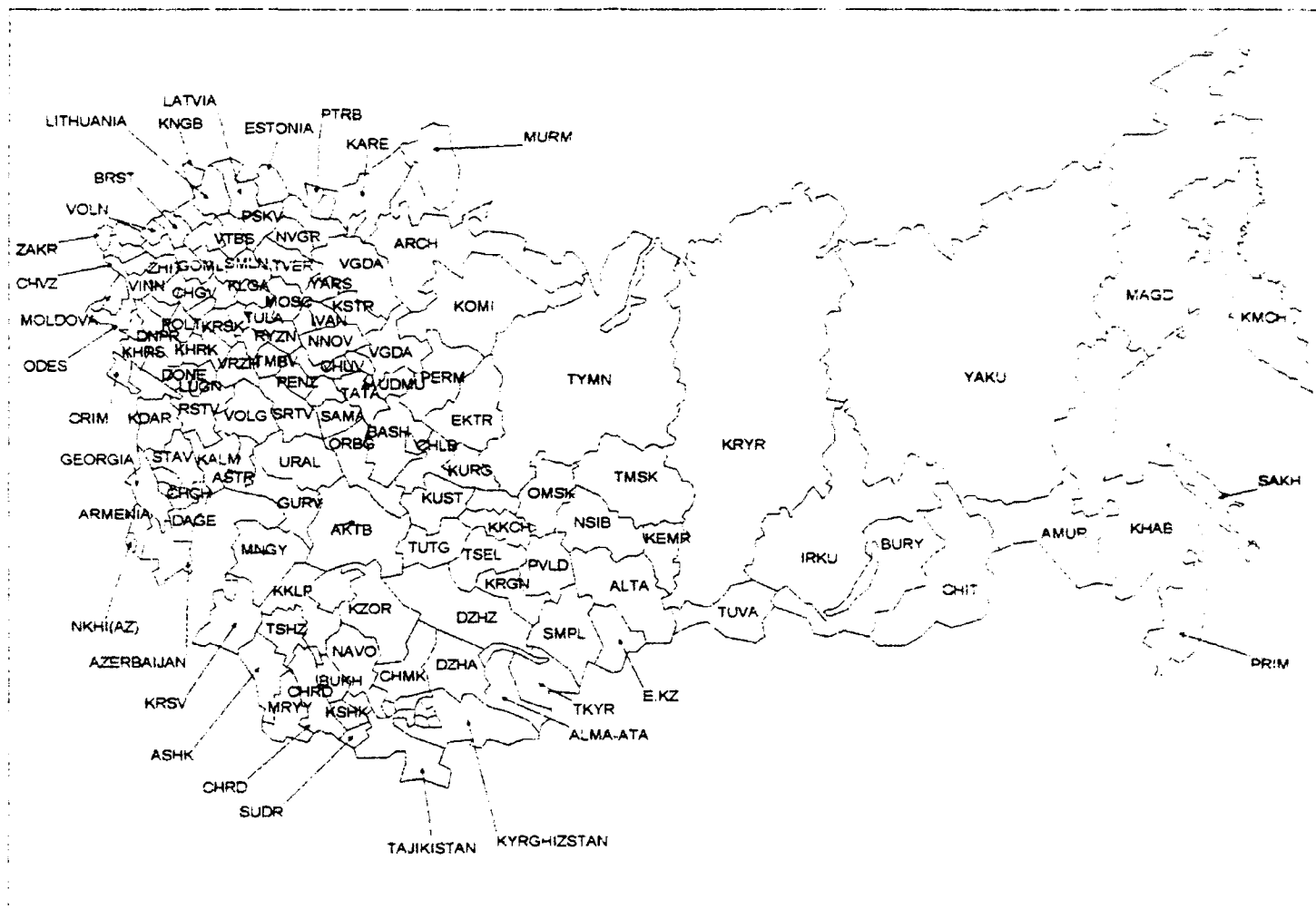
Figure 1a, Number of Significant State –
Owned Businesses engaging in Foreign Trd

98 to 355	(2)
13 to 89	(30)
1 to 12	(85)
8	(31)
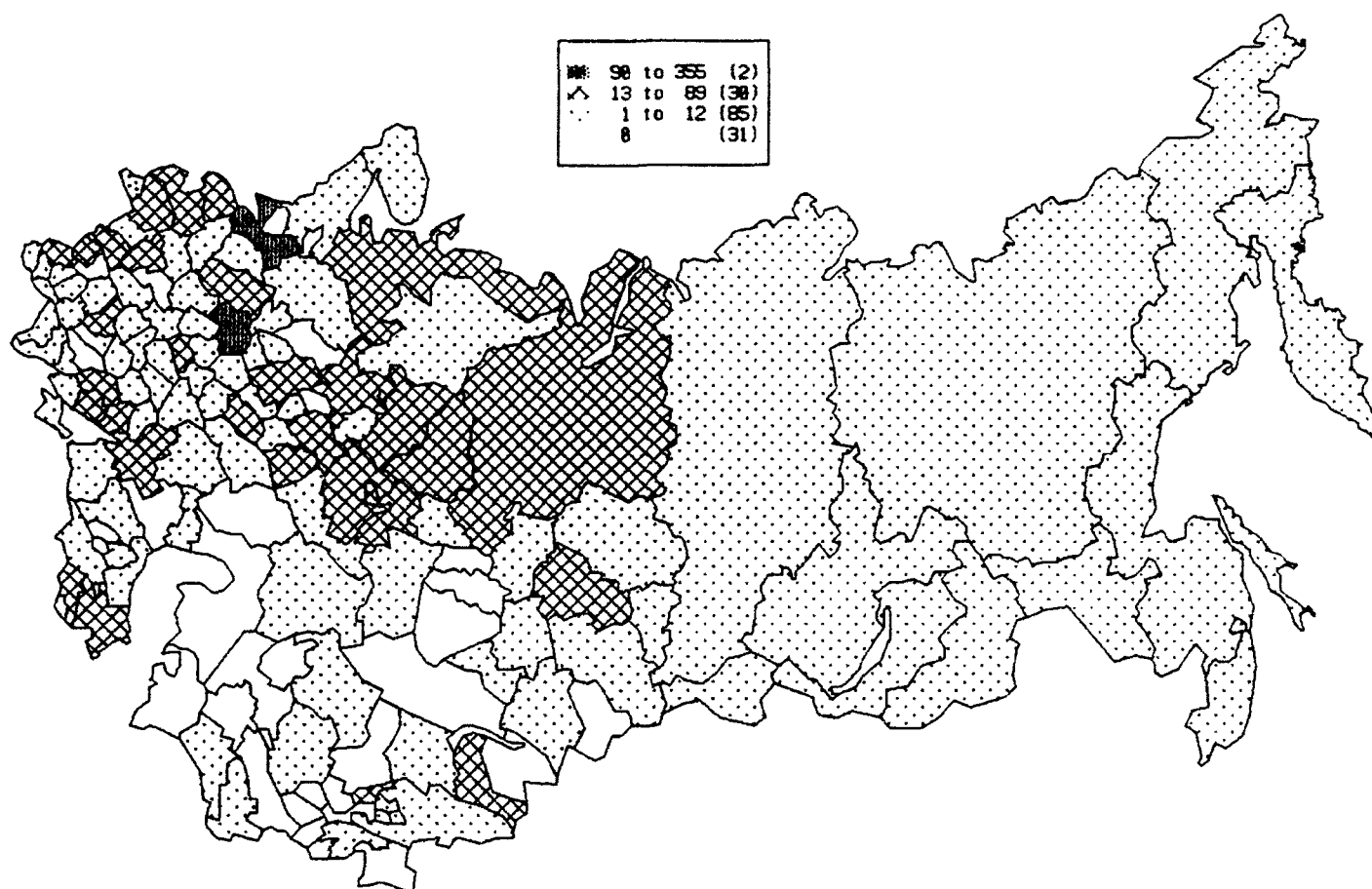
Source: 1991 USSR Business Directory &
1991 Soviet Independent Business Direct.

*Figure 1b , Number of Significant
Cooperatives in the former USSR, Oct 90*

Legend:
- 91 to 252 (2)
- 21 to 90 (16)
- 5 to 20 (58)
- 0 to 4 (72)
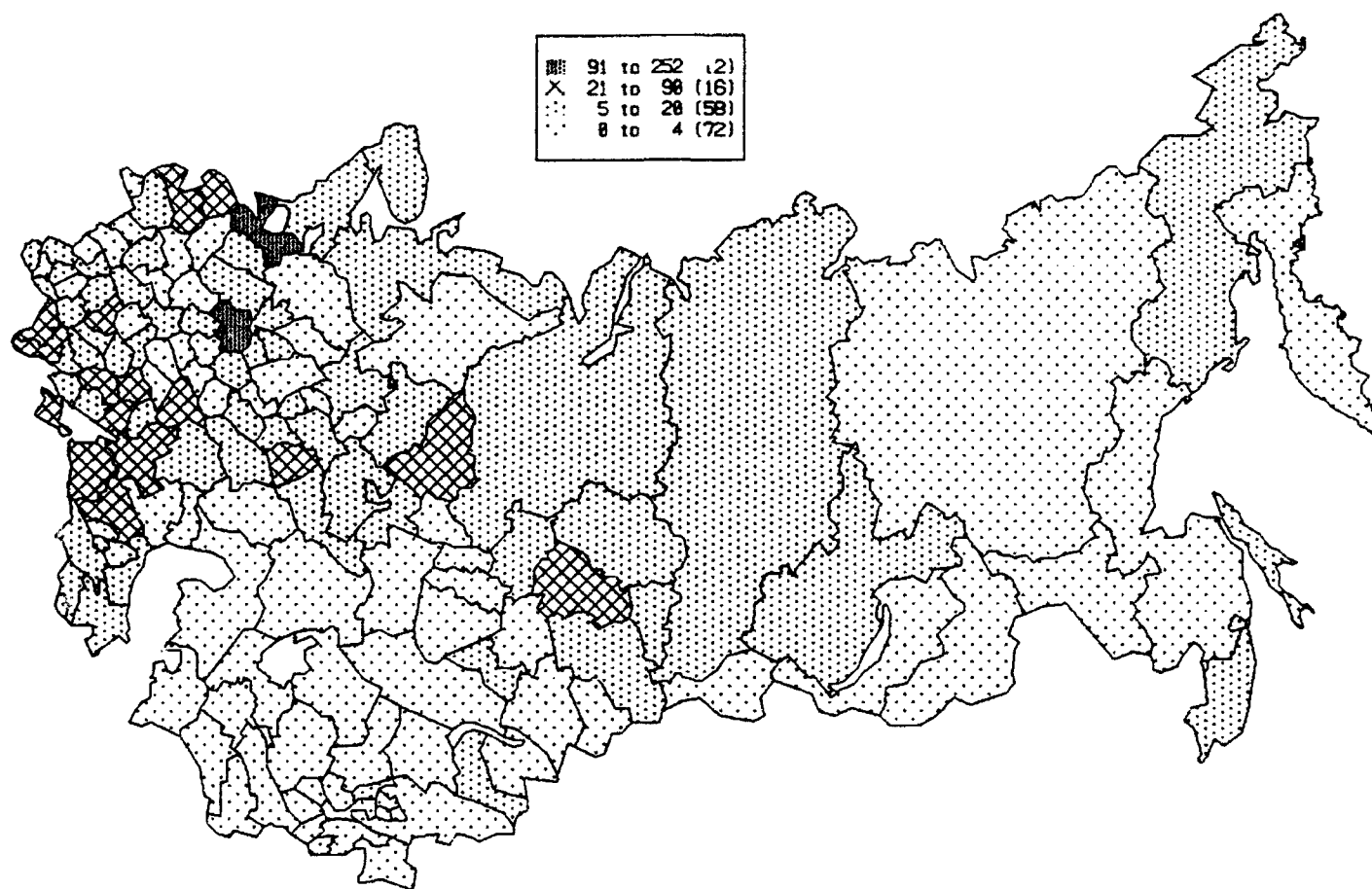
Source: 1991 USSR Business Guide &
1991 Soviet Independent Business Direct.

Figure 1c, Number of Significant Joint Ventures in the former USSR, thru Oct 90

6   (1)
3 to 5 (13)
1 to 2 (37)
0   (97)
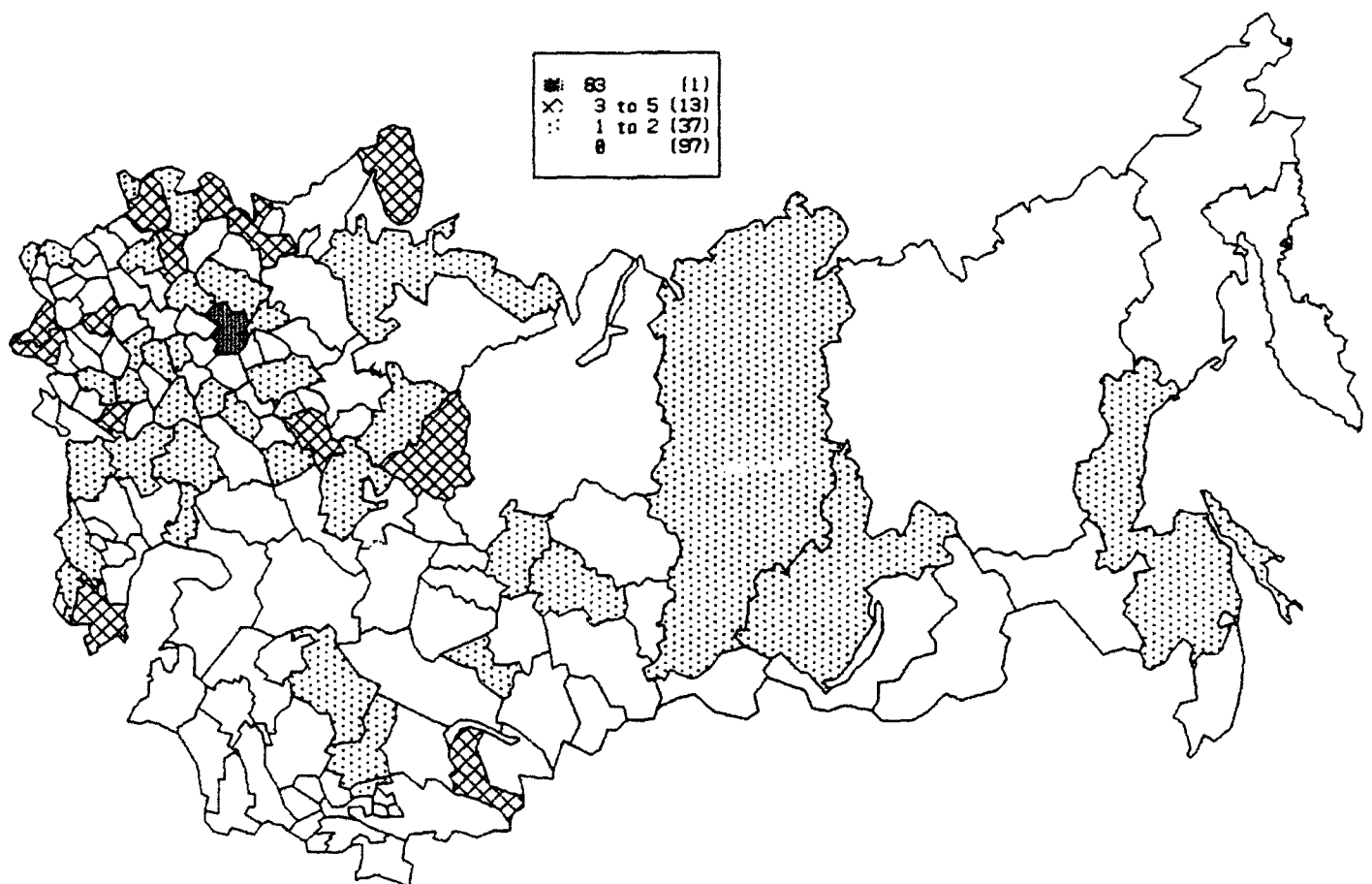
Source: 1991 USSR Business Guide &
1991 Soviet Independent Business Direct.

Table 1.1, Top 20 Joint Ventures with over 4 mil. Rubles Hard Currency Sales through first 3 qtrs 1990

16 JV's

2 JV's

1 JV

St Petersburg

Tver

Moscow

Odessa
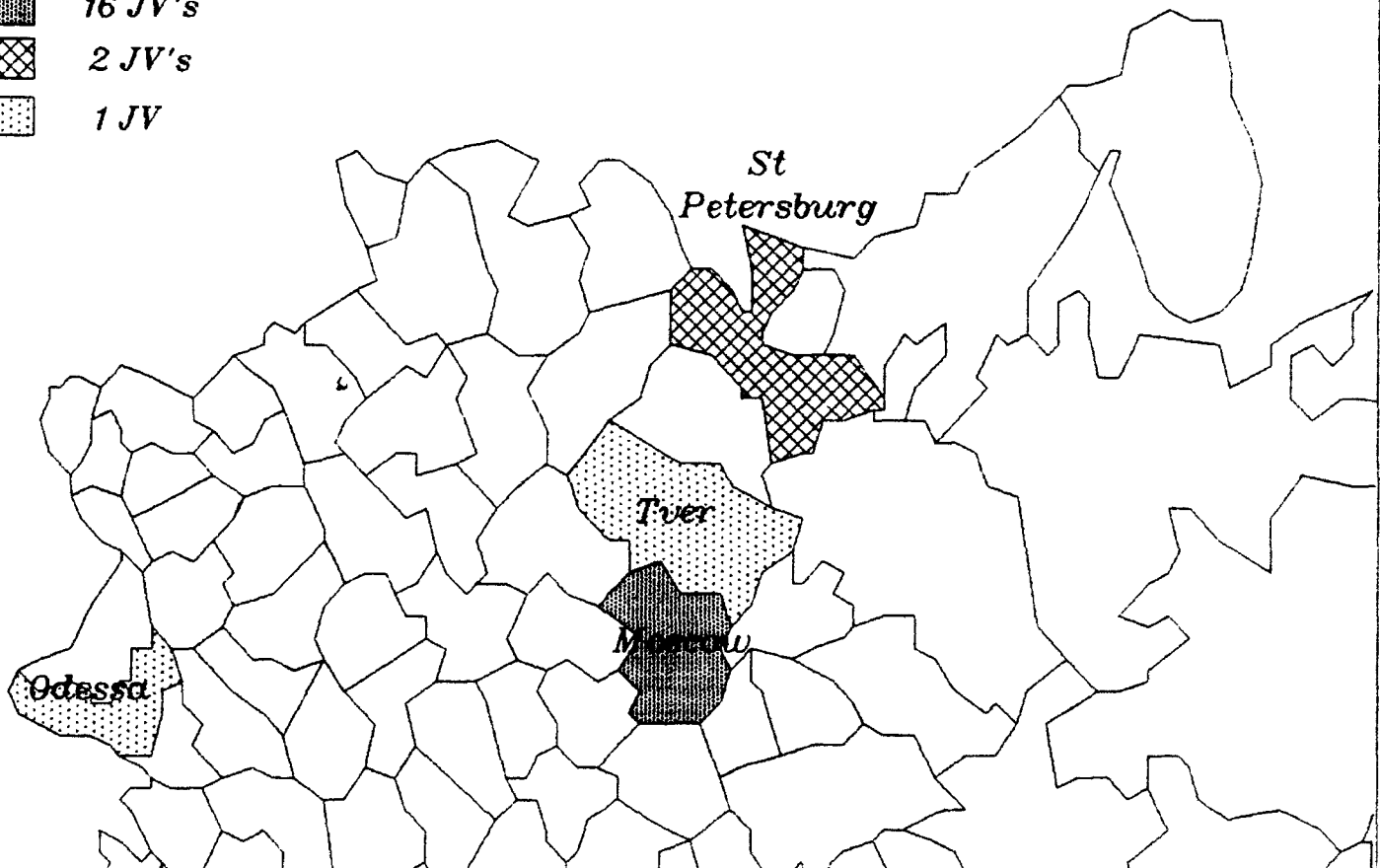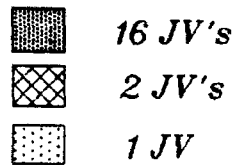
Table 1.2, Top 20 Joint Ventures in Rub.
Sales over 20.7 mil, first 3 qtrs 1990

11 JV's

2 JV's

1 JV

St
Petersburg

Vitebsk

Moscow

Kharkov

Tambov

Tatar ASSR

Sverdlovsk

Krasnodar

Tashkent

1991 Soviet Business Guide
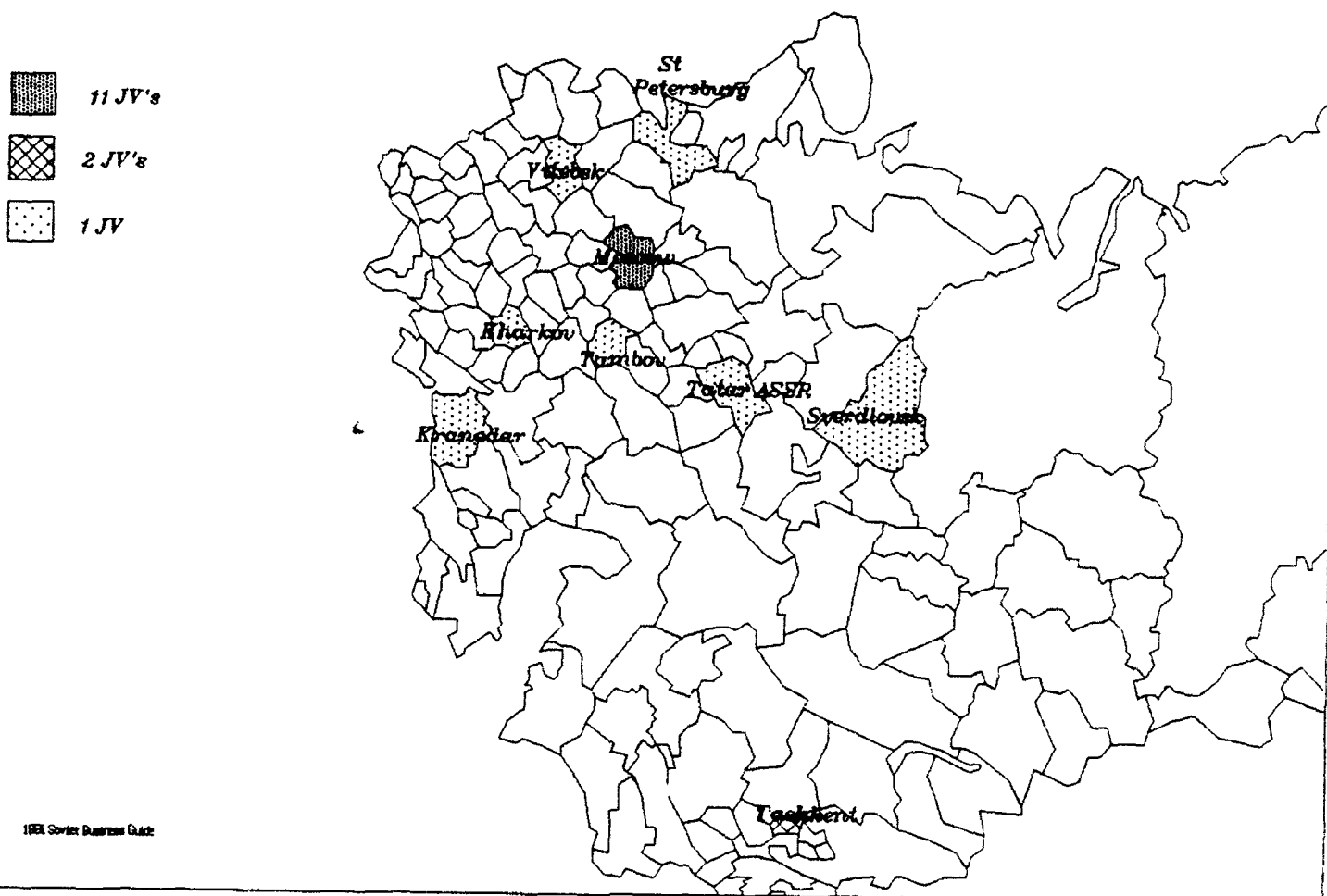
Table 13, Top 20 Joint Ventures with over 1.4 mil Rubles Exports, thru 3 qtrs, 1990

Latvia Estonia St Petersburg

Odessa Moscow

Georgia Sverdlovsk

Karaganda Irkutsk

Khabarovsk Sakhalin

Primorskiy

▦	8 JV's
▩	2 JV's
▨	1 JV
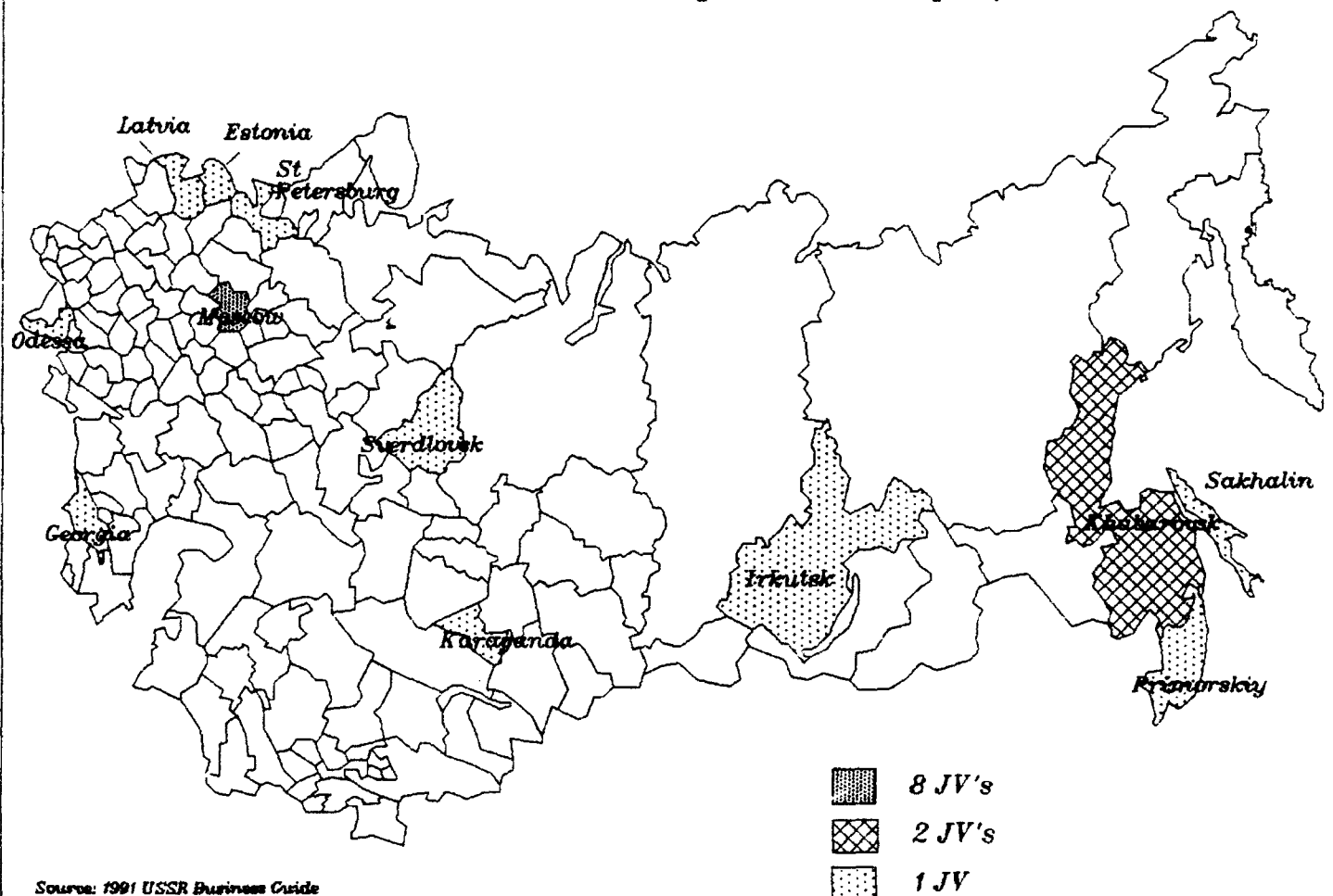
Figure 1d, Number of Operational Foreign Trade Associations, thru end 1990

124		(1)
3 to 13		(3)
1 to 2		(48)
0		(183)
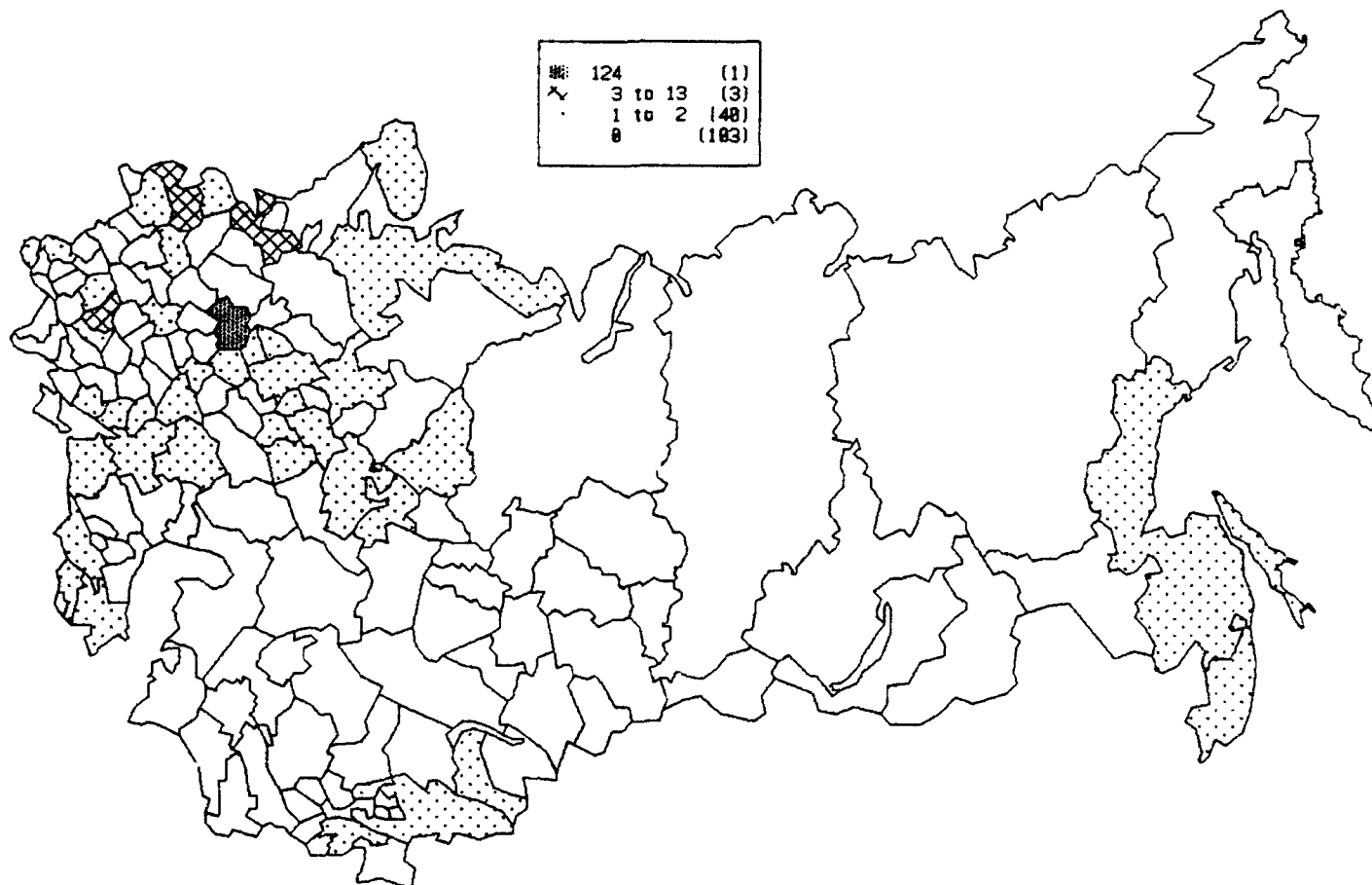
Source: Duns USSR Exporters Direct. 1991

Figure 1. Market Economy Innovators
TOP QUARTILE (37 provinces)
"Connectedness"
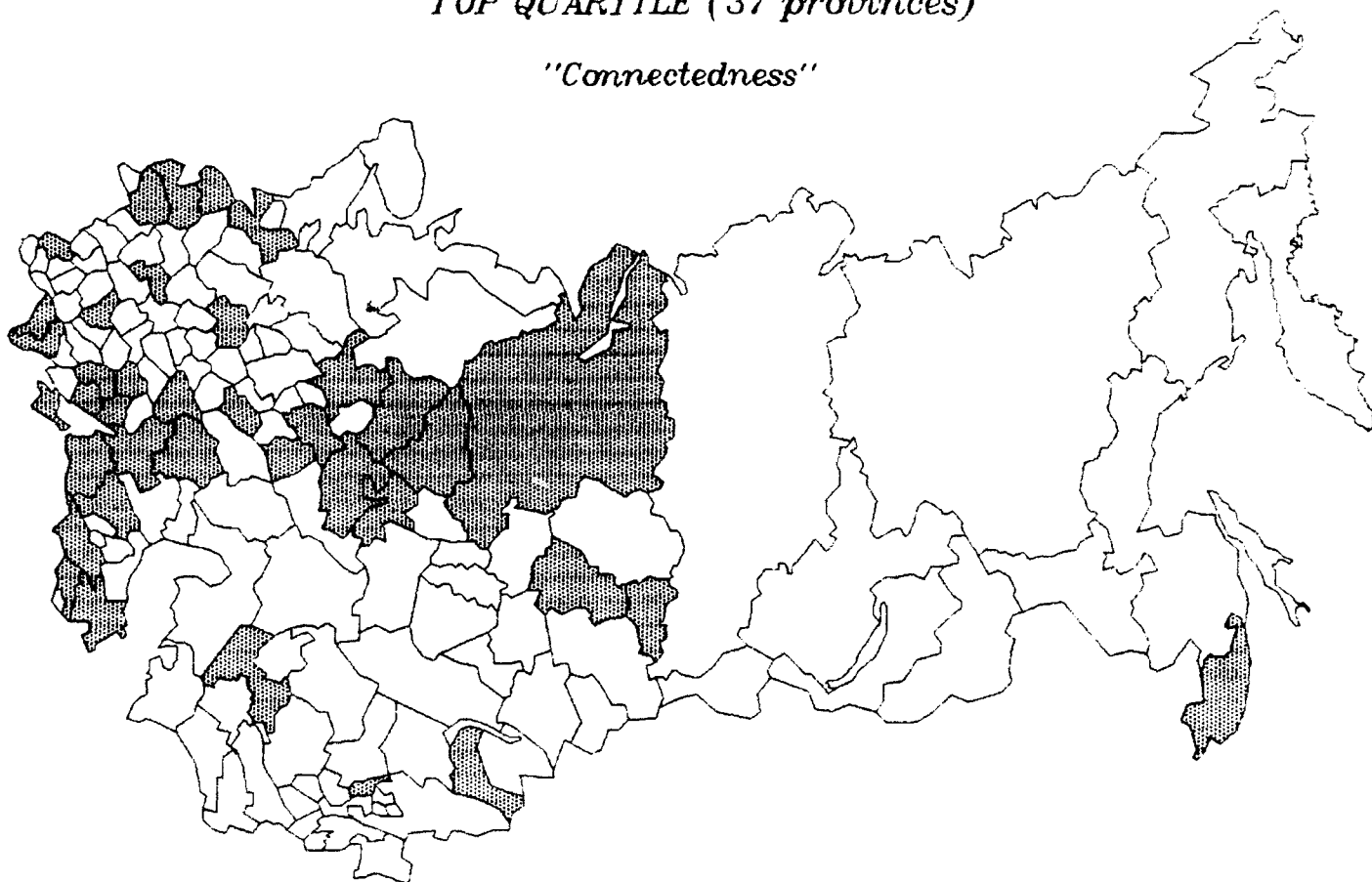
Figure 2. Market Economy Innovators
SECOND QUARTILE (37 provinces)

"High Potential Provinces"
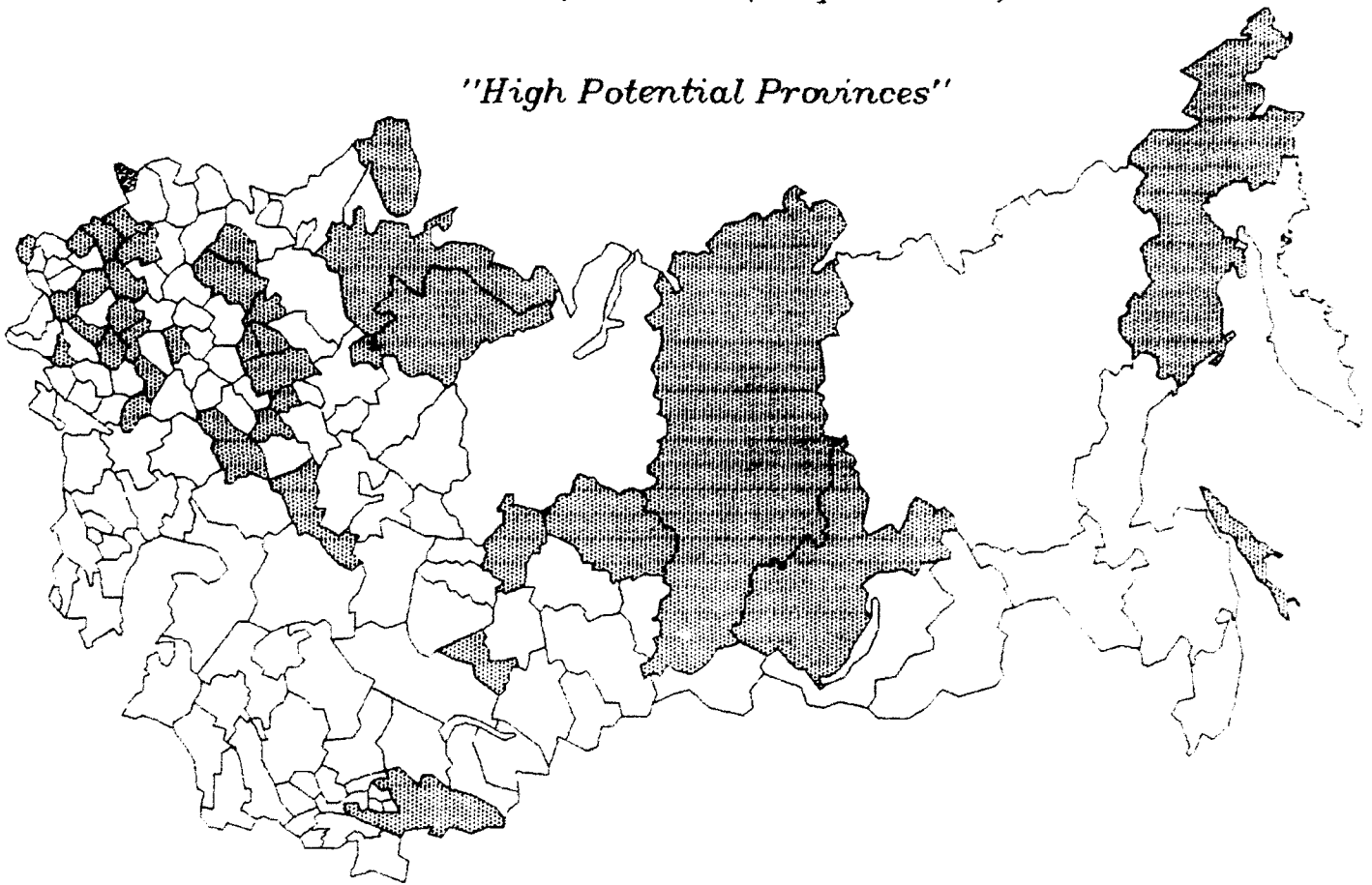
Figure 3. Market Economy Innovators
THIRD QUARTILE (37 provinces)

"Moscow Backwash & Economic Zones"
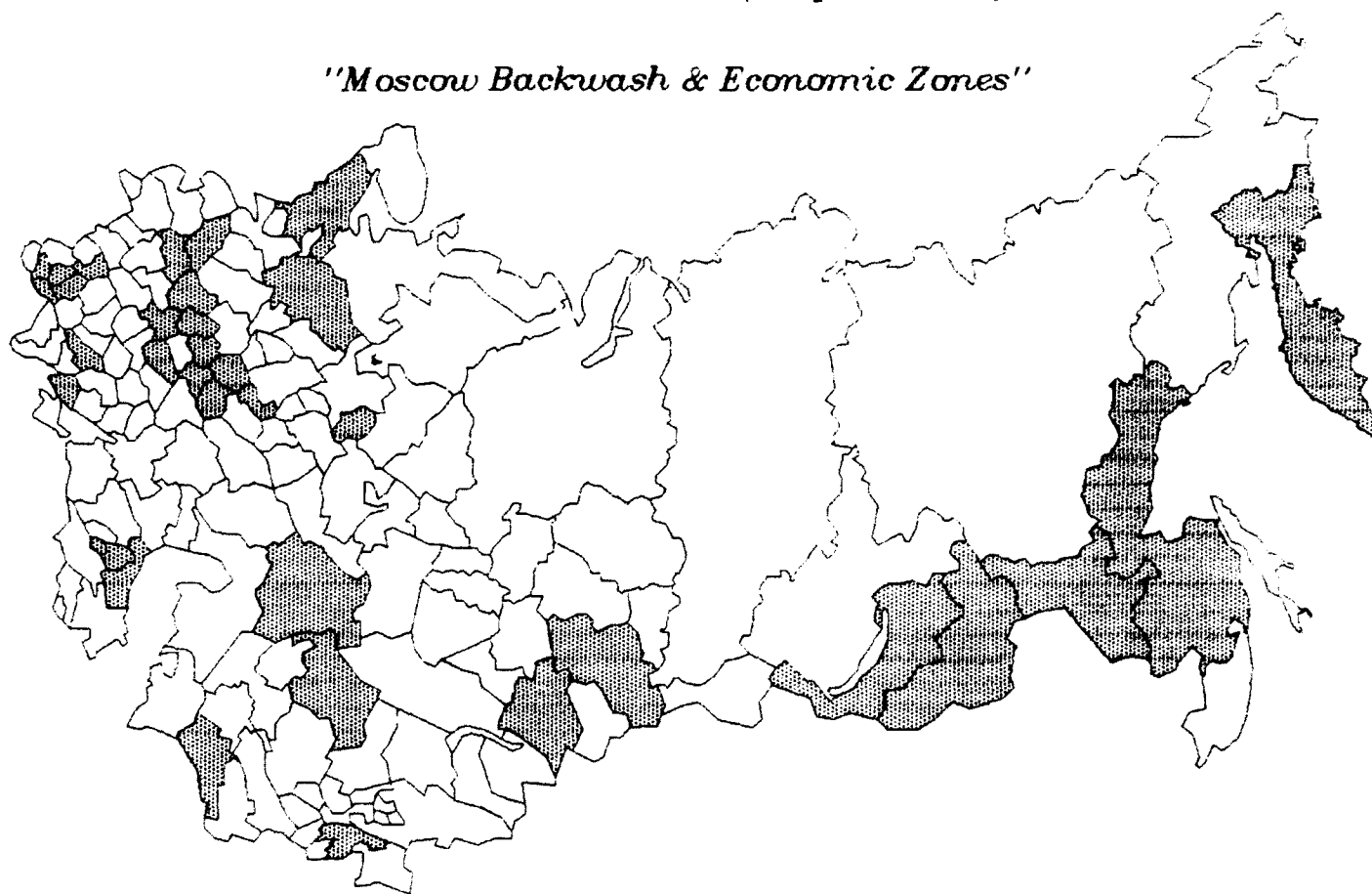
Figure 4. Market Economy Innovators
BOTTOM QUARTILE (37 provinces)

"Central Asian Neglect"
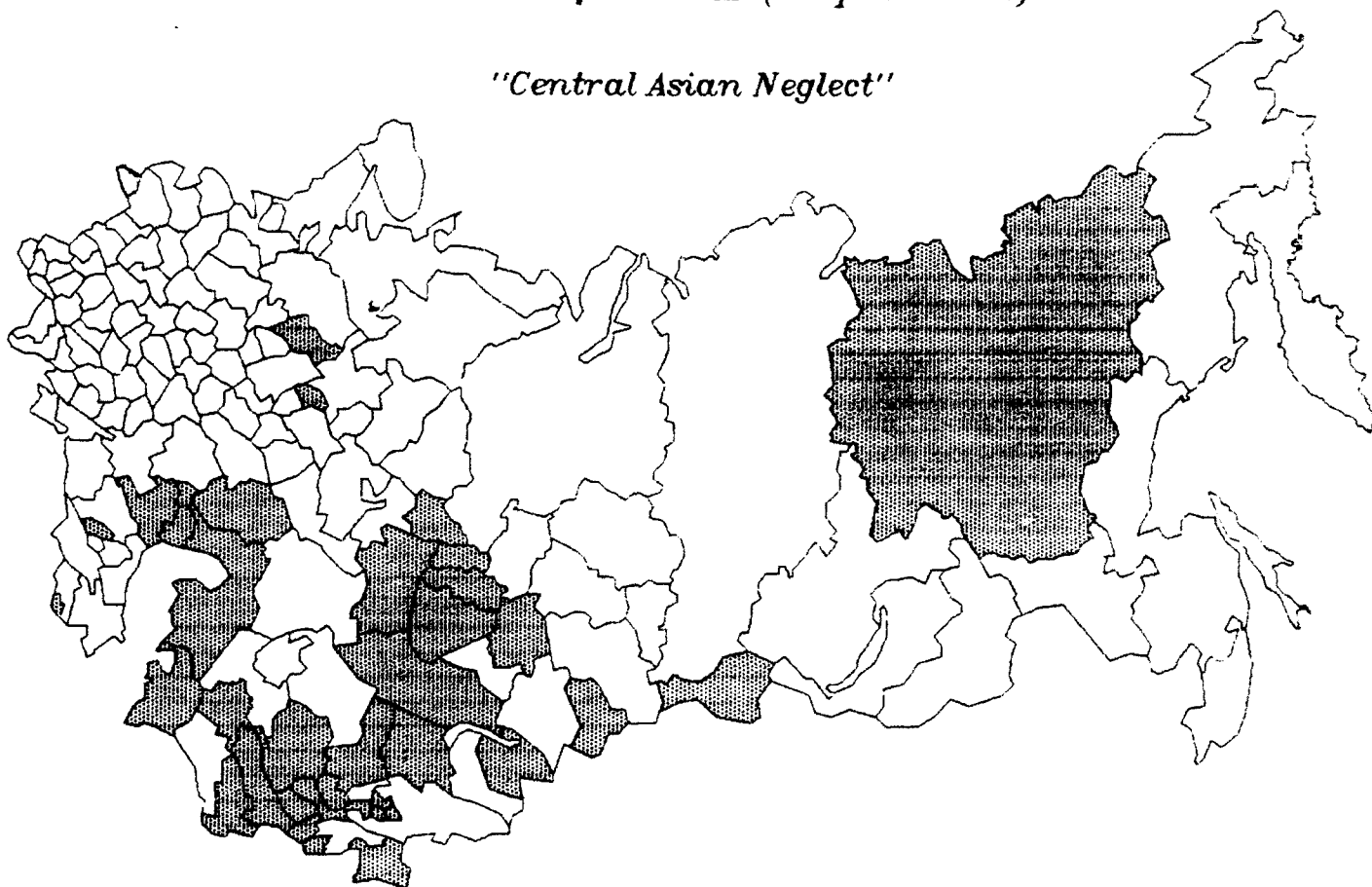
*Figure 6.1, Diffusion of Active
Commodity Exchanges, thru end Dec 1990*

Figure 6.2, Diffusion of Active
Commodity Exchanges, thru end June 1991

Quadrat Index = 1.51 (Clustered)
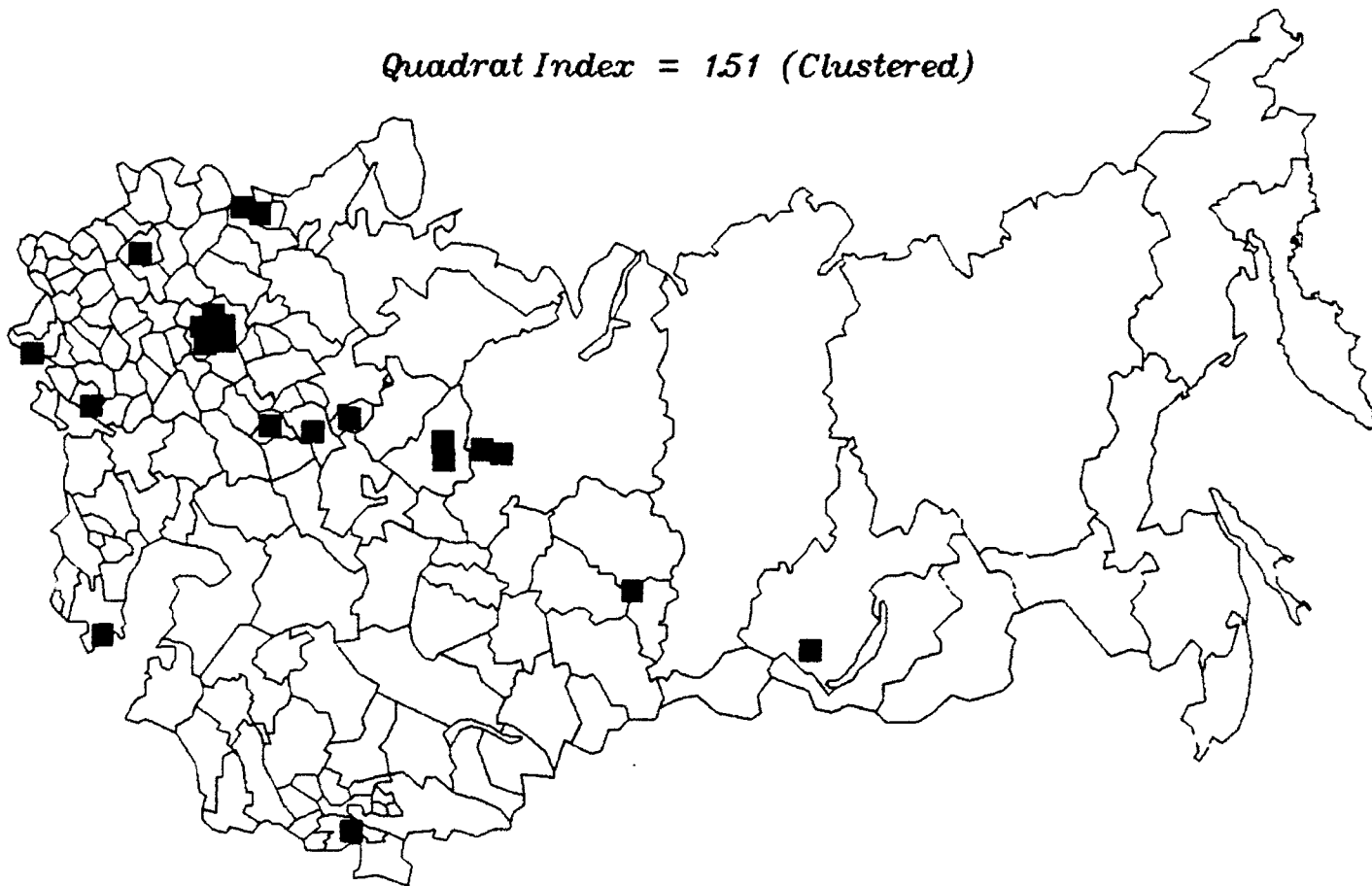
Source: Predicasts F & S, 1991

Figure 6.3, Diffusion of Active
Commodity Exchanges, thru end Dec 1991

Quadrat Index = 2.50 (Clustered)
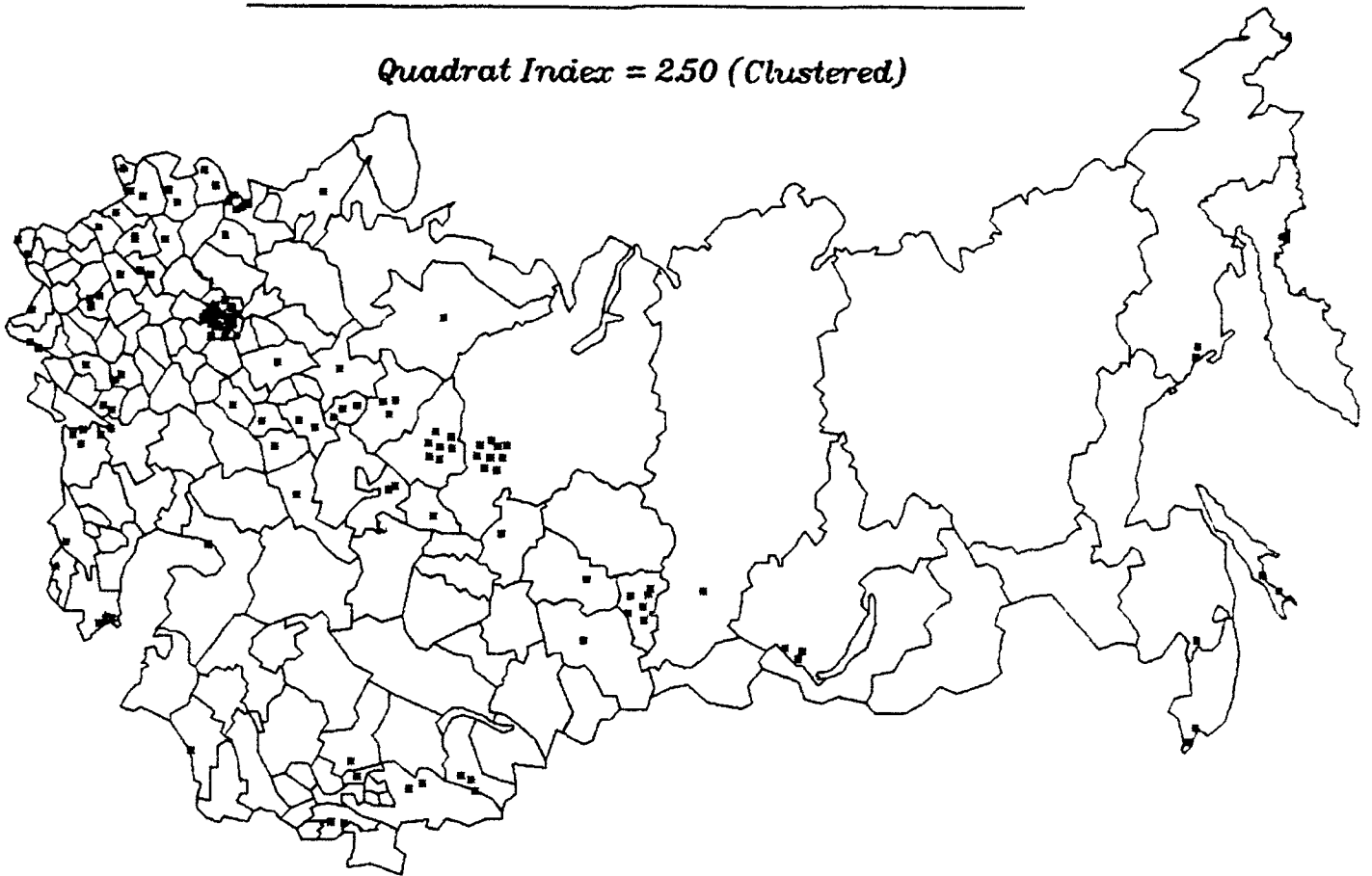
Source: Predicasts F & S Index, 1991

Figure 6.4, Diffusion of Active Commodity Exchanges, thru June 1992

Quadrat Index = 3.18 (Clustered)
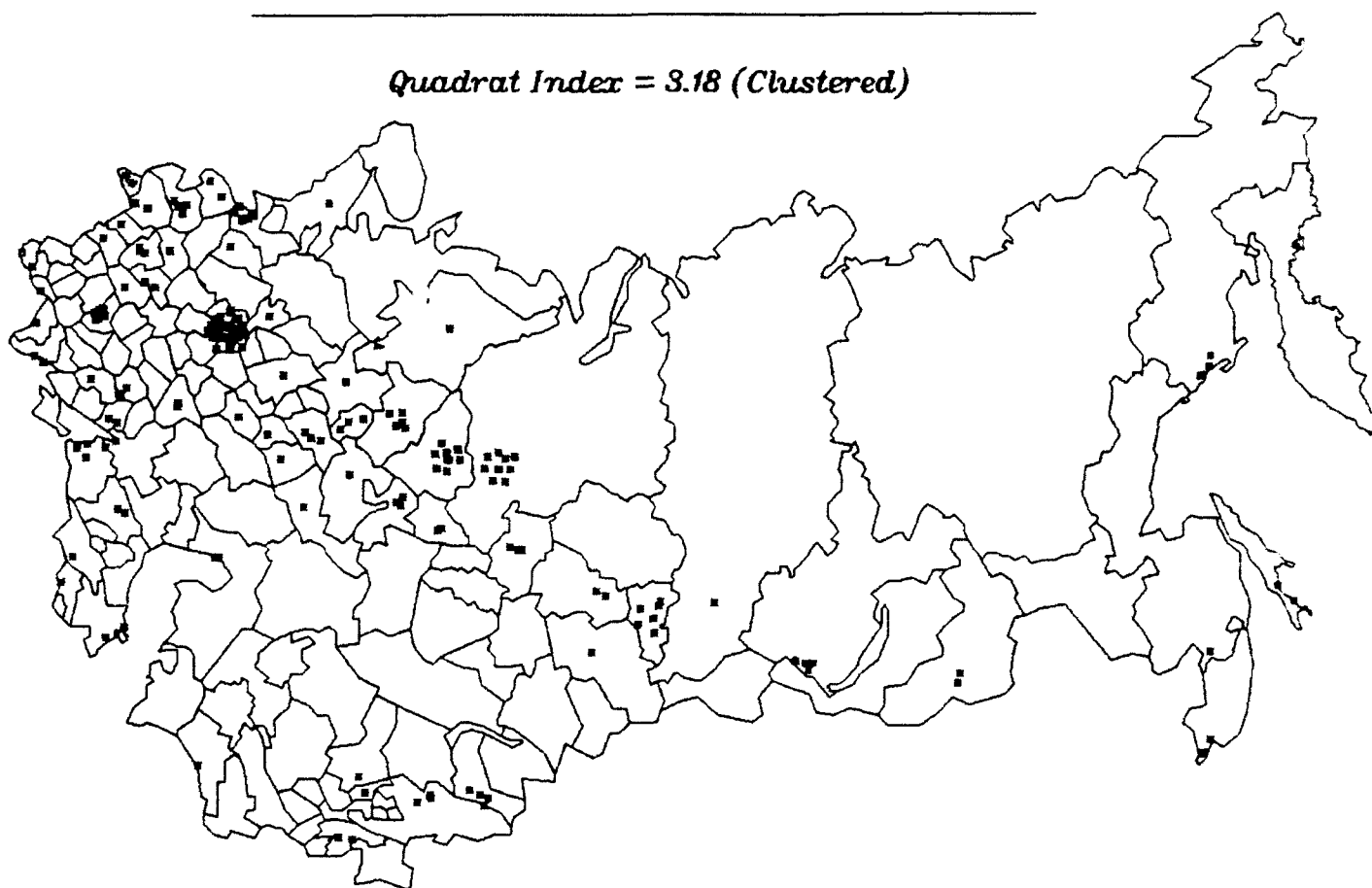
EXPLANATIONS OF DIFFUSION MODELS IN FIGURES 6.5A-6.5C

The fundamental diffusion model can be expressed as the differential equation

$$\frac{d\,N(t)}{dt} = g(t)[N' - N(t)], \quad \text{where}$$

$N(t)$ = cumulative number of adopters at time t

N' = total number of potential adopters in the social system at time t

$$\frac{d\,N(t)}{dt} = \text{rate of diffusion at time t}$$

$g(t)$ = coefficient of diffusion

$F = N(t) / N'$, or the fractional share of potential exchange adopters that has adopted the innovation by time t

* Integration of the above leads to the following logarithmic transformation of three Models:

(1). Internal Influence Model:
$$\ln \frac{F}{1 - F} = c + bt$$

(2). External Influence Model:
$$\ln \frac{1}{1 - F} = at$$

(3). Floyd's Flexible Model:
$$\ln \left(\frac{F}{1 - F} + \frac{1}{1 - F}\right) = c + bt$$

The following Figures 6.5A - 6.5C represent these diffusion models using data on the adoptions of commodity exchanges in the former Soviet Union from May 1990 through June 1992.

* source: Models for Innovation Diffusion (Mahajan/Peterson) (1985)

Fig 6.5AA Evolution of Commodity Exchanges in former USSR

Cumulative Number of Initial Exchange

Adoptions over a 25 month period

Cumulative Adoptions

Time in months (May 90 - June 92)
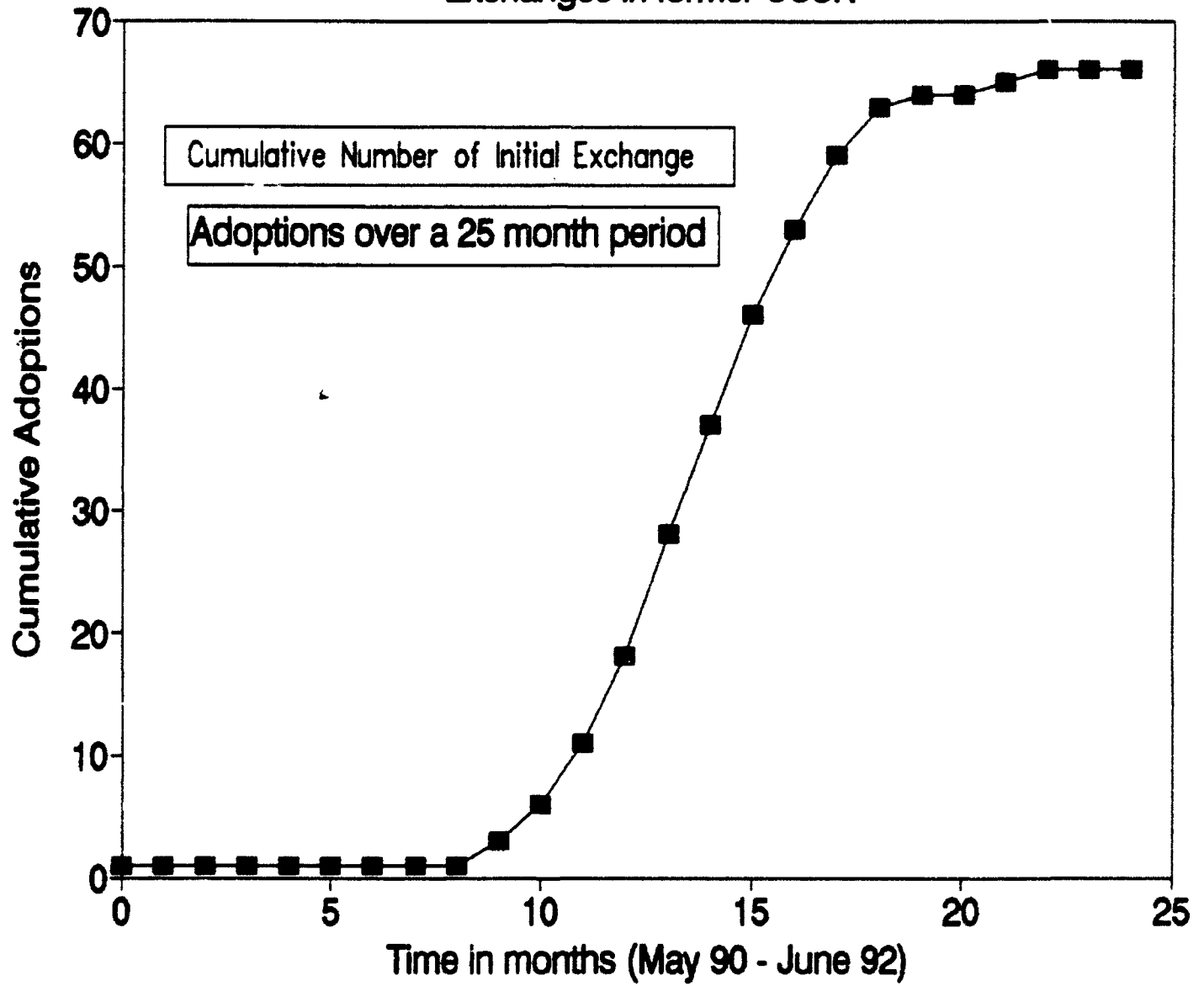
Fig. 6.5A Evolution of Commodity Exchngs in former USSR

logistic Internal Influence Model

$Y = -2.4764 + 0.1196X$

$RSq = 0.8956$

In F/(1-F)

Time in months (May 90 - June 92)
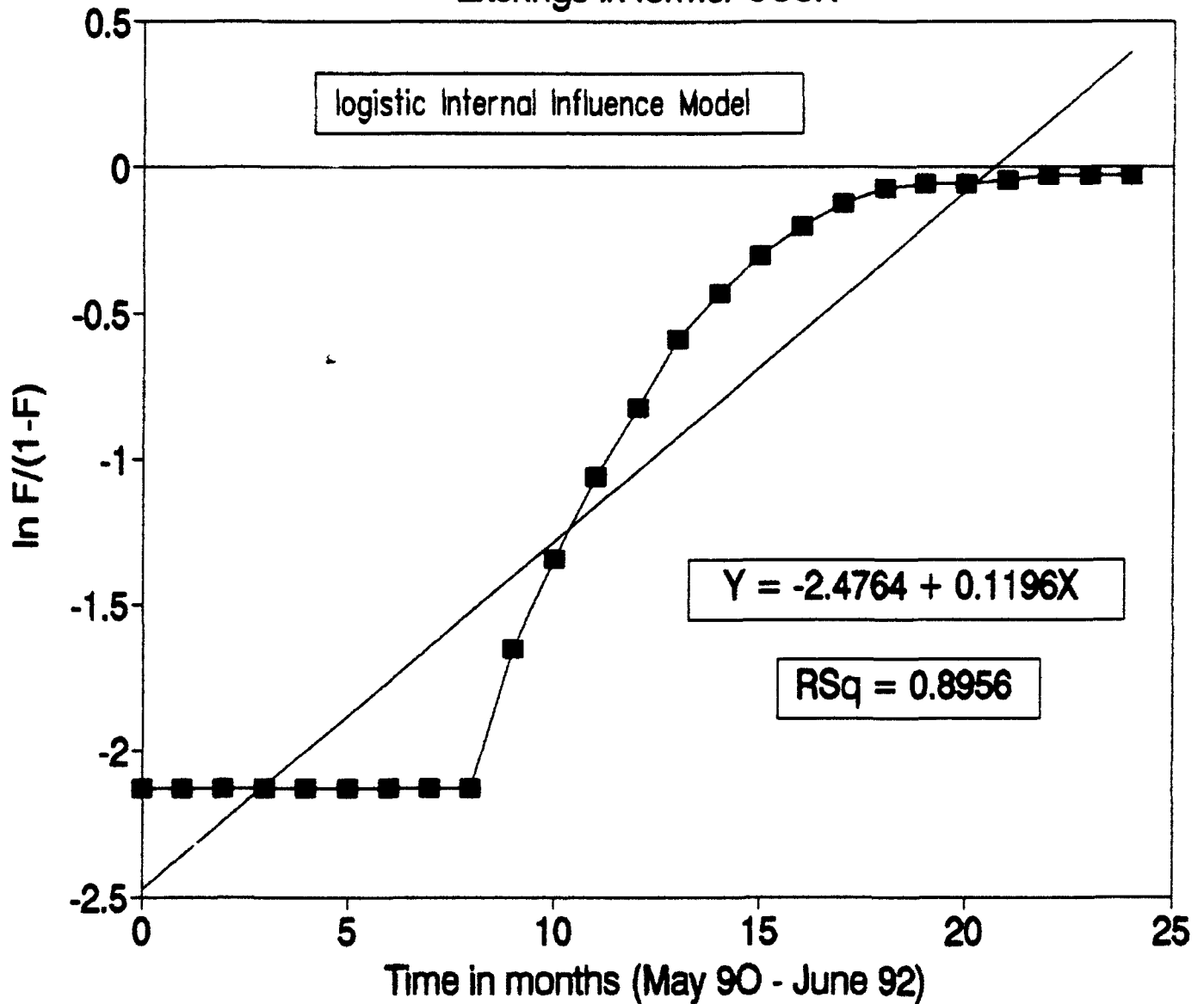
Fig. 6.5B Evolution of Commodity Exchanges in former USSR

logistic External Influence Model

$Y = -0.0682 + 0.0156X$

$RSq = 0.8730$

Time in months (May 90 - June 92)

ln (1/1-F)
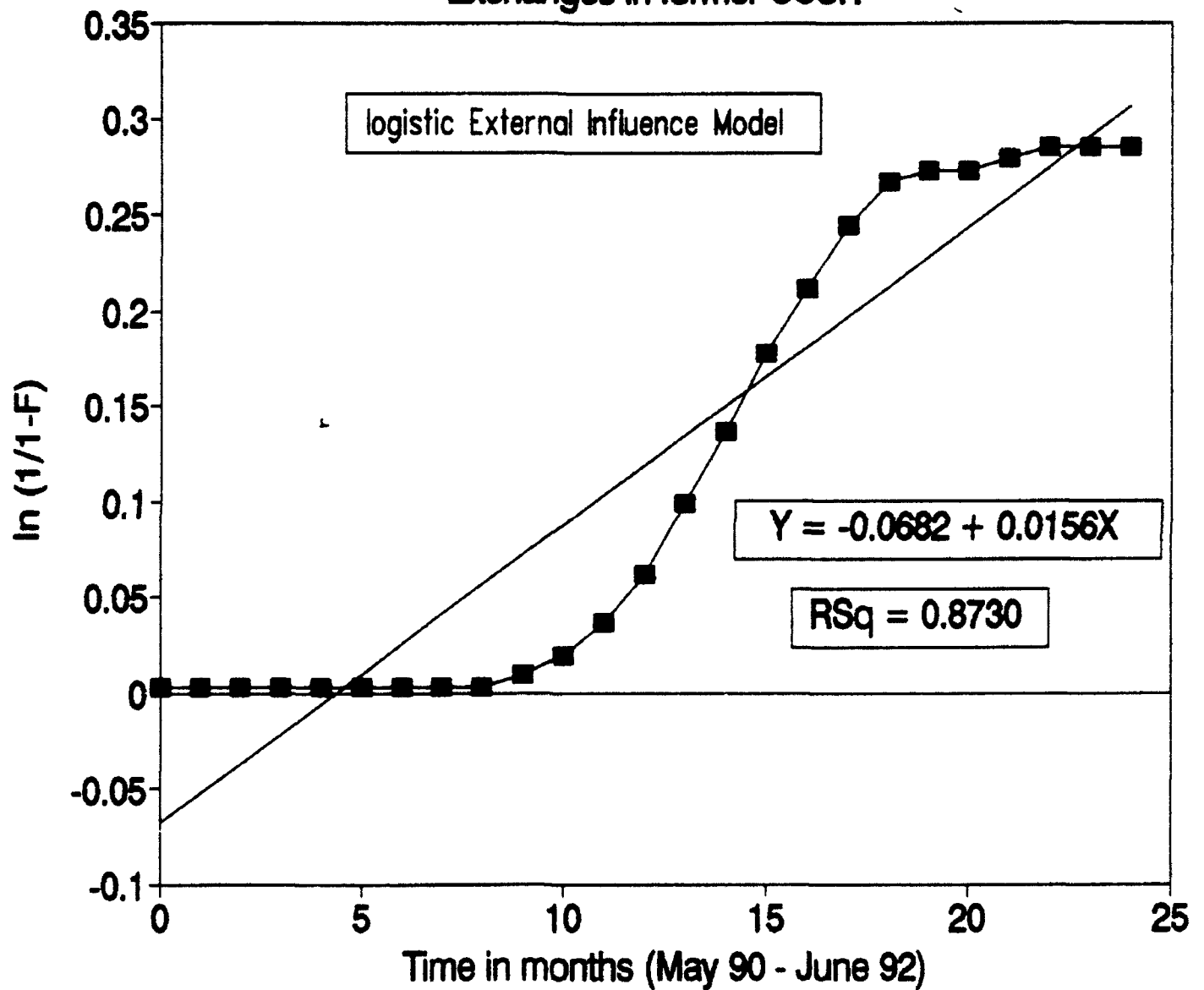
Fig. 6.5C Evolution of Commodity Exchanges in former USSR

Floyd's Flexible Model

Y = -0.1048 + 0.0251X

RSq = 0.8849

ln (F/1-F + 1/1-F)

Time in months (May 90 - June 92)
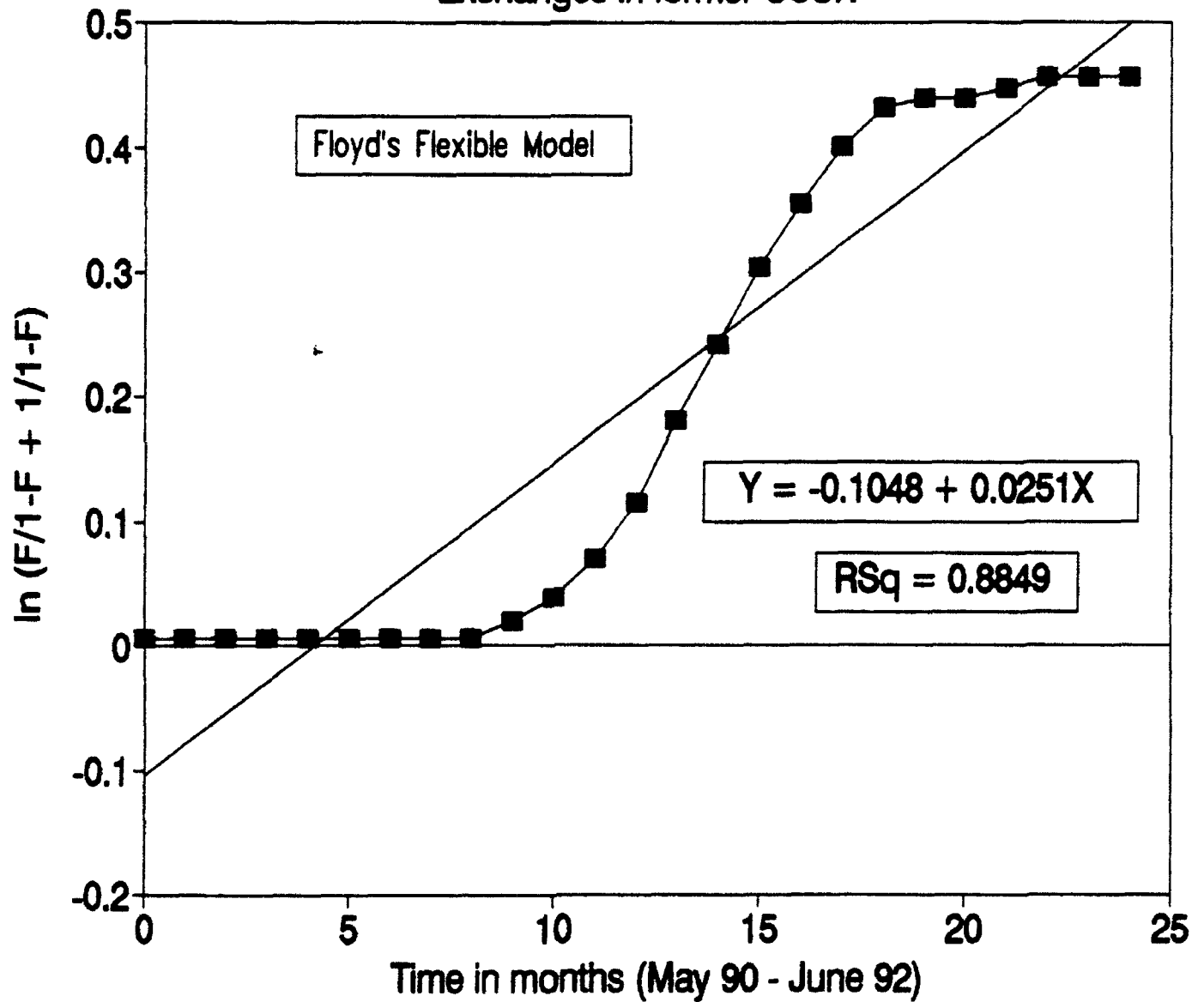
Fig 6.5D Relationship between Date
Initial Exchg Adoption & Avg City Size
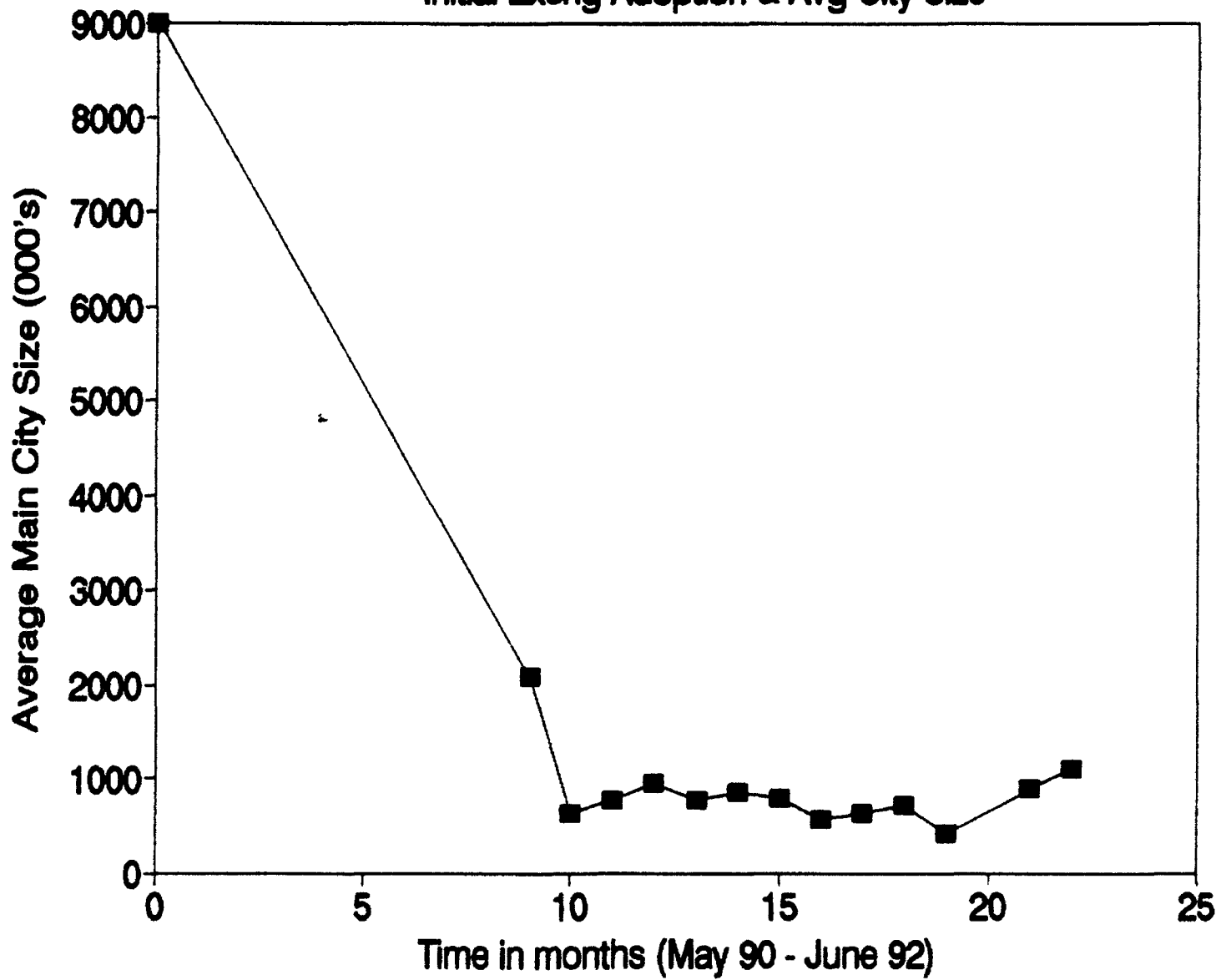
Figure 6.4 Average Price/Seat (000 Rub) at active Commodity Exchgs, 10–12 Dec 91

1848		(1)
300 to 570		(11)
50 to 298		(13)
0		(123)

95

Figure 6.7, Average Price/Seat (000 Rubs)
at Active Commodity Exchgs, 24–26 Dec 91

▓	1400 to 2700	(2)
✕	400 to 980	(8)
∴	50 to 398	(21)
	0	(117)
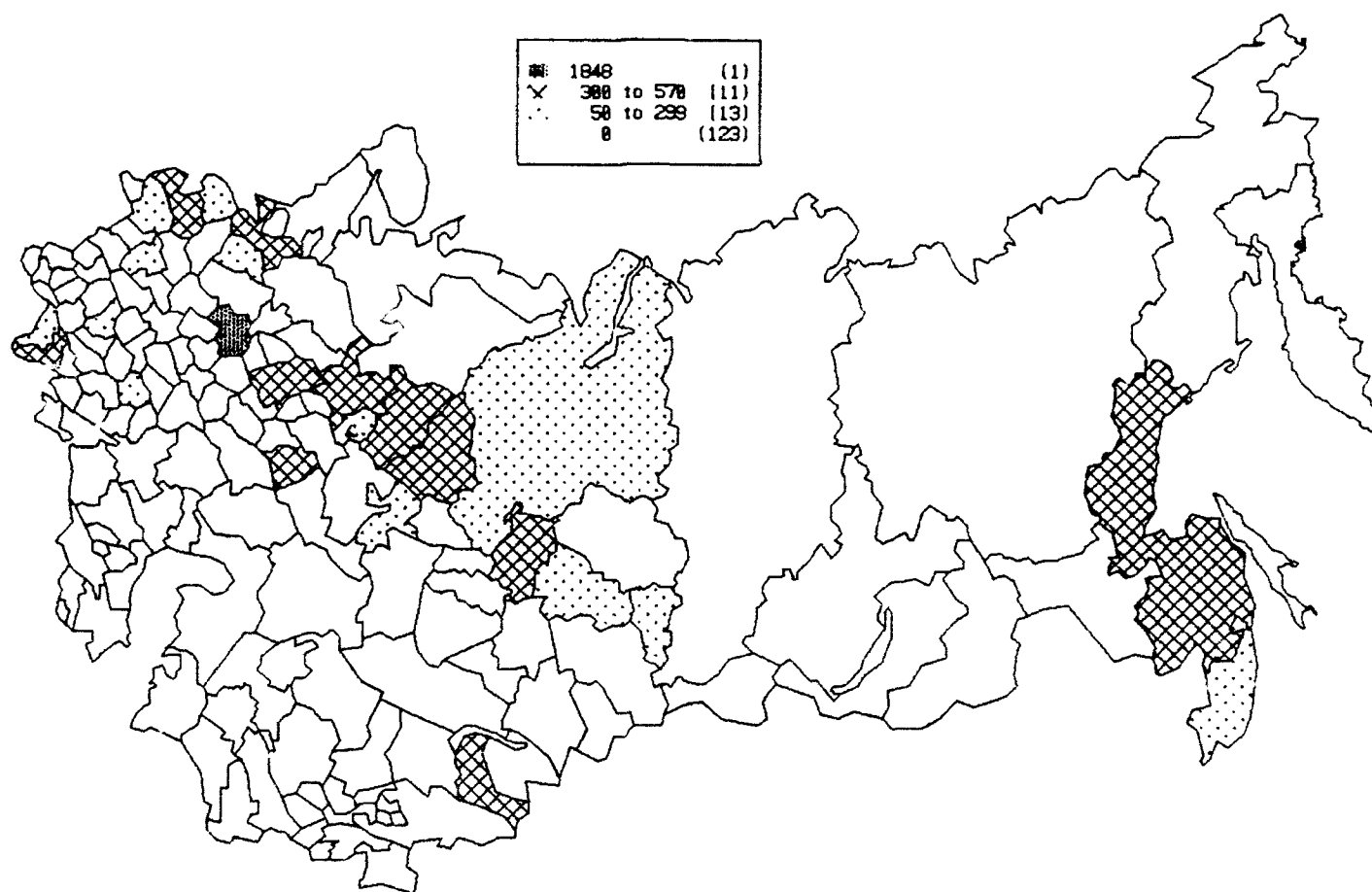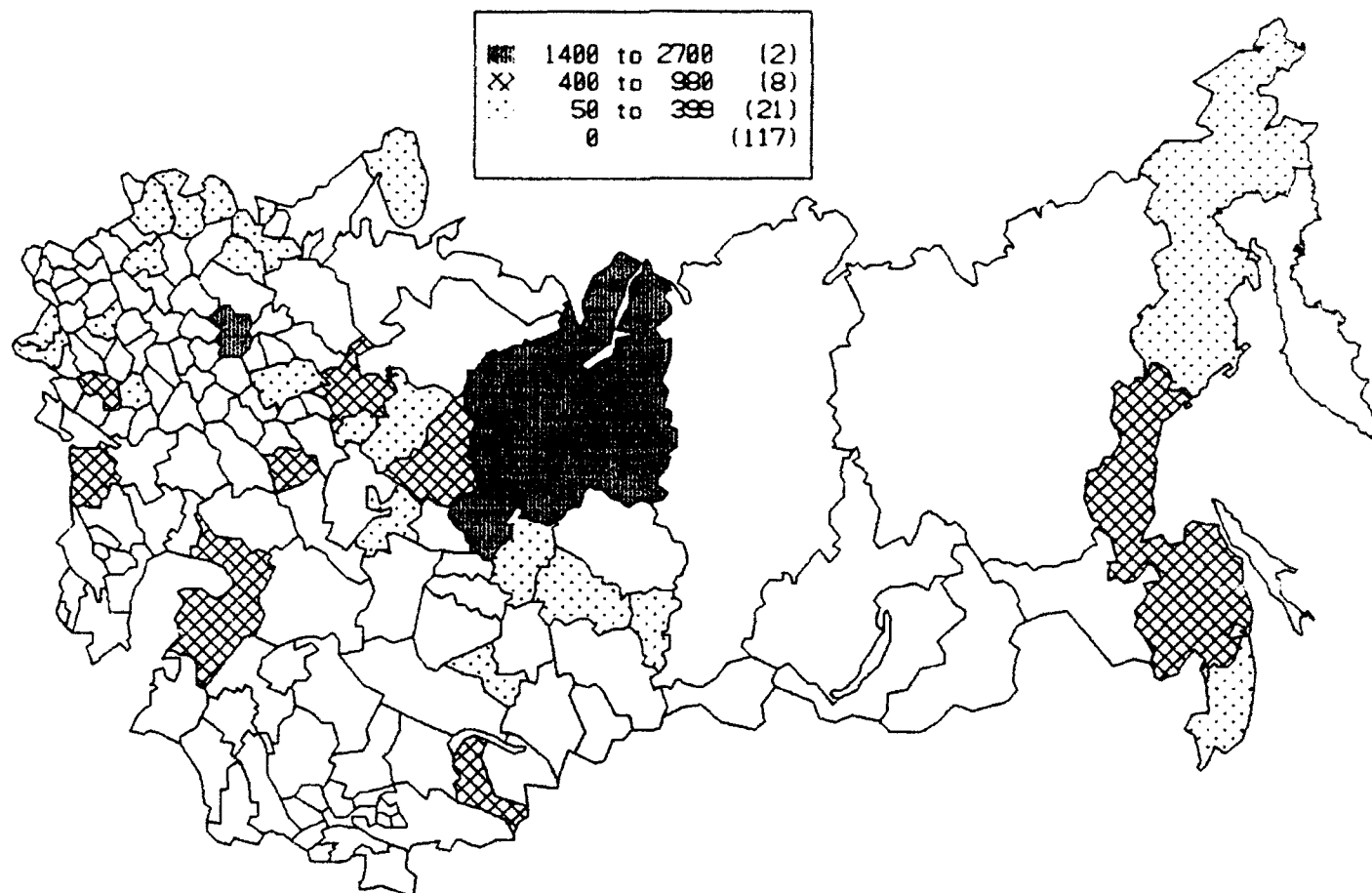
Source: Ekonomicheskaya Gazetta, Jan 92

Fig 6.8 % RSFSR Invstmt Share/Oblast and avg Ruble Exchnge Seat Price

$Y = -66.98 + 216.35X$

$RSq = 0.8247$

Mos

Ekat

St P

% RSFSR Invsmt by Oblast

Avg Rub. (OOO) Seat Price, Dec 10-12,91
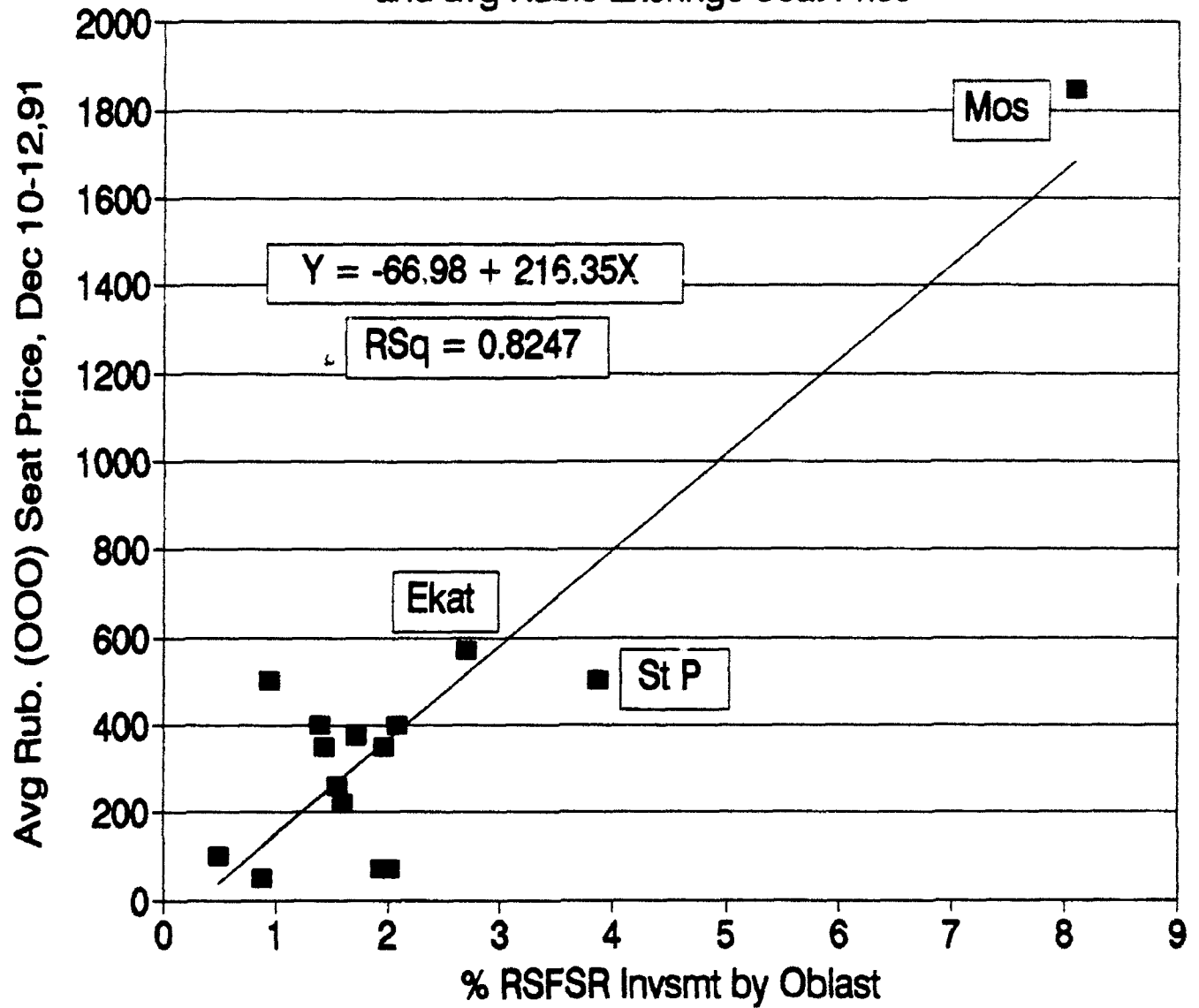
Figure 7.1, State Investment Shares for
RSFSR Oblast–Level Units, 1989 (percent)

▓	3 to 21	(4)
⤫	1.5 to 3	(16)
∴	0.7 to 1.5 (38)	
·	0.1 to 0.7 (21)	
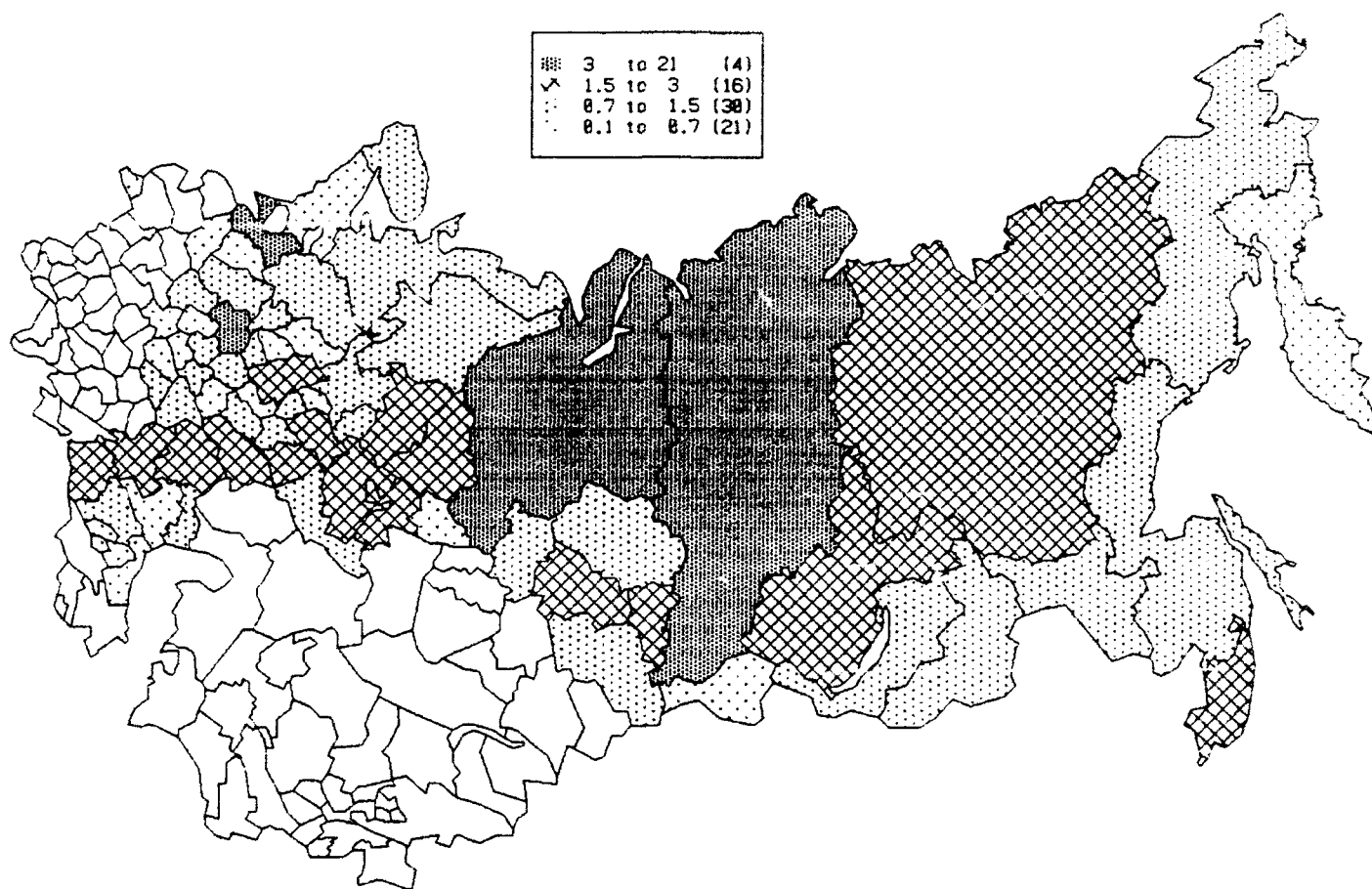
Source: Pokazately, 1990

Fig 8.1 Number of Ural Commodity Exchges per % State Investment

Y = 1.1039 + 0.1878X

RSq = 0.5633

(Y-axis) # Commodity Exchges, thru Jun 92

(X-axis) 1989 % RSFSR Investmt Ural Ob.

Ekat

Perm

Chlb

Udmu

Orbg

Kurg

Bash
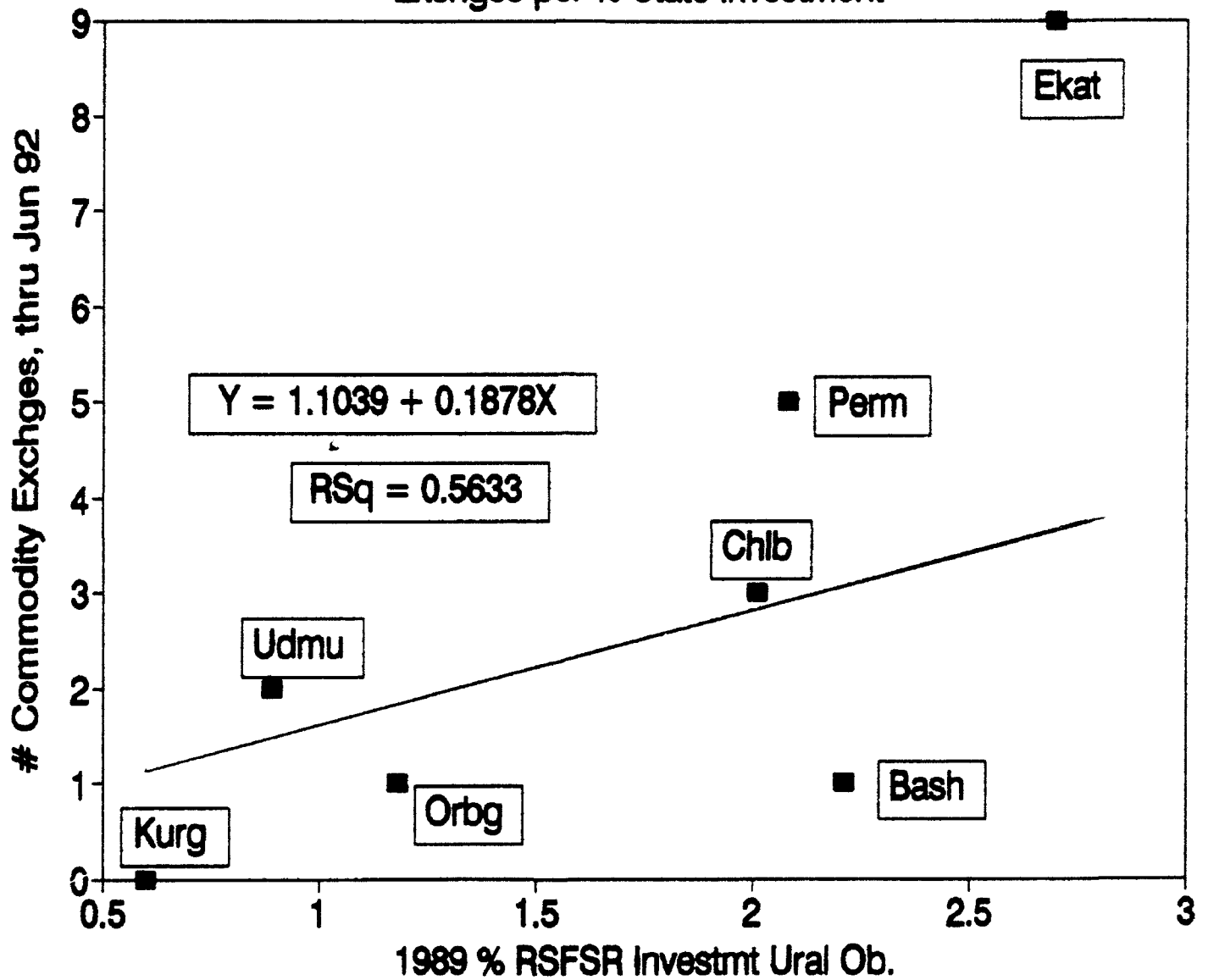
Fig 8.3 Number of Siberian Commodity Exchges per % State Investment

$Y = -0.1649 + 1.0998X$

$RSq = 0.6240$

Tymn

Kmrv

Irku

Commodity Exchges, thru Jun 92

1989 % RSFSR Investmt Siberian Ob.
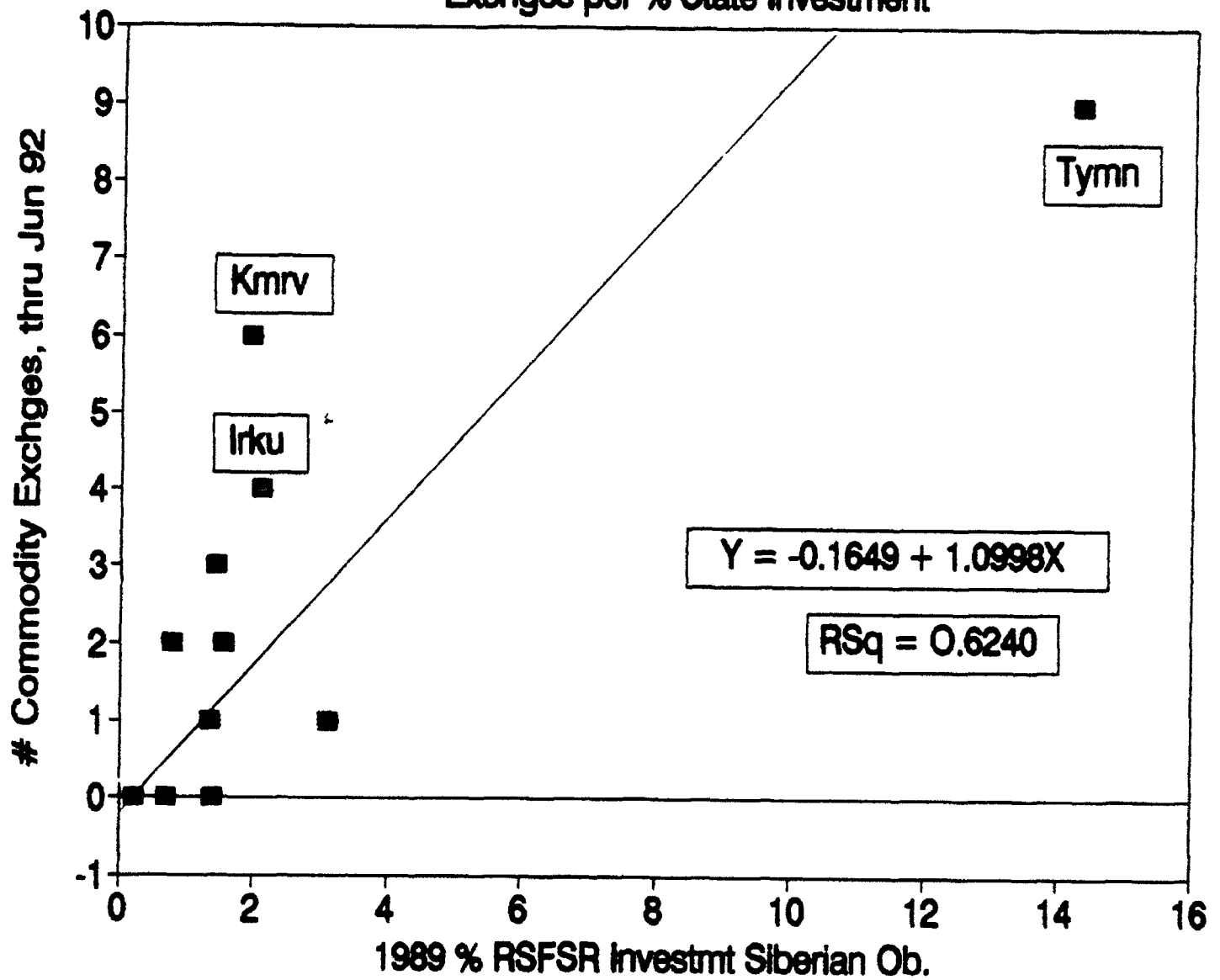
APPENDIX 1.   List of Active Commodity Exchanges
              (by Year / Province)
==

I.   Through end of 1990 (n = 1):

  - Moscow Commodity Exchange (Moscow)

II. Period 1 Jan - 30 June, 1991 (n = 23):

  - Saint Petersburg commodity & stock exchange (St Petersburg)
  - Russian Commodity & Raw Materials (Moscow)
  - Odesskaya Commodity Exchange (Odessa, Ukr)
  - Kuzbasskaya Intl Commodity (Kemerovo, W. Siberia)
  - Simbirsk Commodity Exchange (Ulyanovsk)
  - Kuznetskaya Tovarno-Syrjevaja (Far East)
  - Moscow Universal Trade Exchange (Moscow)
  - Republican Commodities & Securities (Udmurt)
  - Siberian Commodity Exchange (Angarsk, E. Siberia)
  - Navruz (Dushanabe, Tajikistan)
  - Belorussian Universal Exchange (Minsk, Belarus)
  - Surgut Commodity & Raw Material (Tyumen, W.Siberia)
  - Rossijskaya Bumaga (Moscow)
  - Estra (St Petersburg)
  - Mogilev Commodity (Mogilev, Belarus)
  - Akhalinskaya Commodity Exchange (Sakhalin, Far East)
  - Perm Commodity Exchange (Perm)
  - Moscow Intl TV Industry Exch (Moscow)
  - Lugankglavsnab (Voroshilograd)
  - Tyumenian Commodities (Tyumen)
  - Alisa (Moscow)
  - Rossijskaya Lesnaya Birzha (Ekaterinburg)
  - Donskaya Birzha (Donetsk)

III. Period 1 July - 31 December 1991 (n = 113)

  - Mogilev Universal (Mogilev, Belarus)
  - Tadjik Republican Commodity (Dushanabe, Tajikistan)
  - Khabarovsk Commodities & Securities (Khab, Far East)
  - Kazan Universal Exchange (Kazan, Tatar)
  - Ural Commodity & Raw Material (Ekaterinburg)
  - Tyumen Germes (Tyumen)
  - Malgret (Krasnoyarsk)
  - Karagandinskaya Inter-regional (Karaganda, Kazak)
  - Asian Exchange (Irkutsk, E. Siberia)
  - Baikalskaya Birzha (Udmurt)
  - Uralskaya Birzha (Ekaterinburg)
  - Nizhegorodskaya Commodities (Gorky)
  - Udmurtia Republican Commodity (Udmurt)

- Bolshoj Ural (Ekaterinburg)
- Business Club-90 (Moscow)
- Unibalt (Riga, Latvia)
- St Petersburg Television (St Petersburg)
- Moscow Central Byrzh (Moscow)
- Byrzh Russian Paper (Moscow)
- Baltic Inter-regional Universal (Riga, Latvia)
- Chemicals Exchange (Moscow)
- Moscow Biotechnology Exchange (Moscow)
- Chelyabinskaya Investment (Chelyabinsk)
- Yuzhno-Rossijskaya Food Exch (Krasnodar)
- Tyumen Commodities & Securities (Tyumen)
- Ural-Germes (Ekaterinburg)
- Sverdlovskaya Commodity (Ekaterinburg)
- Vladivostok Raw & Commodity (Primorskiy)
- Rossijskaya Yarmarka (Chita)
- Ural Bryzh Center (Ekaterinburg)
- Zhelenograd Commodity Exchange (Kemerovo)
- Siberian Commodity Exchange (Novosibirsk)
- Omsk Commodity & Stock Exchange (Omsk)
- Kiev Universal Exchange (Kiev, Ukr)
- Kiev Commodity Exchange (Kiev, Ukr)
- Odessa Agriculture Byrzh (Odessa, Ukr)
- Ukraine/Siberian Commodity Exchange (Kharkov, Ukr)
- Kharkov Commodity (Kharkov, Ukr)
- Guryev "Tenghiz" Commodity & Stock Exchange (Guryev, Kazak)
- Kishinev Univeral Exchange (Moldova)
- Estonian Universal Exchange (Estonia)
- Kazakh Central Byrzh (Alma-Ata, Kazak)
- Murmansk Exchange (Murmansk)
- Viborg Universal Exchange (St. Petersburg)
- Novgorod Commodity Exchange (Novgorod)
- Bryzh for Land & Produce (Moscow)
- Moscow Grain Universal Exchange (Moscow)
- Russian Grain Universal Exchange (Moscow)
- Samara Byrzh (Samara)
- Privolskaya Universal (Volgograd)
- Dnepropetrovsk Universal (Dnepropetrovsk, Ukr)
- Karaganda Byrzh (Karaganda, Kazak)
- Gomel Commodity & Raw Material (Gomel, Belarus)
- Brest Commodity Exchange (Brest, Belarus)
- Vitebsk Commodity Exchange (Vitebsk, Belarus)
- Ivano Commodity Exchange (Ivano-Frank, Ukr)
- Grodno Commodity Exchange (Grodno, Belarus)
- **Kemerovo Commodity (Kemerovo, Sib)**
- **Uzbek Exchange (Tashkent, Uzbek)**

IV. Period 1 Jan - 30 Jun 1992 (n = 50)

- Niva Commodity Exchange (Murmansk)
- Ukrainian Exchange (Kiev, Ukr)
- Nikopolis Exchange (Kiev, Ukr)

- Sochi Intl Commodities & Secur (Krasnodar)
- Kuban commodity Bryzh (Krasnodar)
- Kaliningradskaya Commodity (Kalinigrad)
- Far Eastern Trade (Sakhalin)
- Tyumenskaya Commodity & Stock (Tyumen)
- Exchange Congress (Lithuania)
- Penzenskaya Commodity Exchange (Penza)
- Kemerovoskaya Intl Exchange (Kemerovo, Siberia)
- Siberian Exchange Concern (Tyumen)
- Bajal Exchange (Kazan, Tatar)
- Minsk Exchange (Minsk)
- Tallinn Commodity & Stock (Estonia)
- Azerbaijan People's Exchange (Baku, Azer)
- Kalingradskaya Commodity & Stck (Kalingrad)
- North Caucasian Universal (Rostov)
- Delovoj Dvor (Rostov)
- Russian Fishery Exchange (Kaliningrad)
- Karelia Intl Commodity Exchaneg (Karelian ASSR)
- VPK (St Petersburg)
- Bakinskaya Birzha (Azerbaijan)
- ExNet (Moscow)
- Perm Regional Ecology Exchange (Perm)
- Intl Information & Telecom (Moscow)
- Russia Computer Exchange (Moscow)
- Moscow Farmers Exchange (Moscow)
- Magadan (Far East) Commodity (Magadan)
- Konversya (St Petersburg)
- Russian Universal Industrial (Moscow)
- Nizhevartovsk Oil Exchange (Tyumen - Nizhevartovsk)
- Zakarpatskaya Universal Exchange (Zakarpat, Ukr)
- Noyabr Commodity & Raw Material (Tyumen)
- Kievskaya Exchange (Kiev, Ukr)
- Magadanmashoptorg (Magadan, Far East)
- Novokuzntesk Commodity (Far East)
- All-Russian Real Estate Exchange (Moscow)
- Russian Fuel & Energy Exchange (Moscow)
- Tbilisskaya Universal Exchange (Tbilisi, Georgia)
- Erevanskaya Commodity & Raw (Yerevan, Armenia)
- Vorkutinskaya Commodity Exchange (Komi ASSR)
- Orenburgskaya (Orenburg)
- Kuzbasskaya Intl Commodity (Kemerovo)
- Chelyabinskaya Commodity & Inv (Chelyabinsk)
- Donetskaya Commodity Exchange (Donetsk)
- Vladivostokskaya Commodity (Primorskiy)
- Kaliningrad Commodity & Secur (Kaliningrad)
- Surgut Commodities & Raw Materials (Tyumen)
- Zauralskaya Commodity Exchange (Tajikistan)
- Kirgizskaya Commodity & Raw (Kirghiz)
- Tsentrosoyuz (Moscow)
- Kirghiz Universal Commodities & Securities (Kirghiz)
- Vilnius Exchange (Lithuania)
- Sakhalin Commodity Exchange (Sakhalin)
- Permian Commodity Exchange (Perm)
- Moscow Non-Ferrous Metals (Moscow)

- Bukovin Universal Exchange (Chernovtsy, Ukr)
- Sverdlovskaya Commodity Exchange (Ekaterinburg, W. Sib)
- Trans-Ural Universal (Ekaterinburg, W. Sib)
- Gurevskaya Commodity & Stock Exchange (Guryev, Kazak)
- Estra Commodity & Stock Exchange (Moscow)
- Chelyabinskaya Universal Exchange (Chelyabinsk, Ural)
- Kirgizskaya Commodity Exchange (Kirghiz)
- Lesnaya Birzha Forest Exchange (Moscow)
- Moskovskij Pushnoj Auktsion (Moscow)
- UTB Universal Commodity Exchange (Moscow)
- Aerospace Exchange (Latvia)
- Fermer Agricultural Exchange (Moscow)
- Sibir TV Exchange (Novosibirsk)
- Irkutskij Exchange Union (Irkutsk)
- Hard Currency Exchange (Kazan, Tatar)
- Kustanajskaya Commodity & Raw (Kustanay, Kazak)
- Sibirskoe Koltso (Omsk)
- TMB Germes (Tyumen)
- Kolyma, Susuman Gold Exchange (Moscow)
- Azerbaijan's People's Exchange (Baku, Azer)
- Yaroslavl Universal Exchange (Yaroslavl)
- Tsaritsyn Universal Exchange (Volgograd)
- Vilnius Real Estate Exchange (Lithuania)
- Chita Commodity & Raw Material (Chita)
- GFTB Tenghiz (Guryev, Kzak)
- Mezhdunarodnaya Birzha (Stavropol)
- Voronezhskaya Commodity Exchange (Voronezh)
- Belorussian Universal Exchange (Minsk, Belarus)
- Sank Petersburg Commodities/Securities (St Petersburg)
- Bashkir Intl Commodity (Bashkir)
- Intl Kaliningrad Commodities & Securities (Kaliningrad)
- TD Germes (Tyumen)
- Russia Investment & Tender (Moscow)
- Sibirskaya Stock Exchange (Omsk)
- Baltic Intl Exchange (Latvia)
- Russia's Intl Eastern European Exchange (Moscow)
- PMTFB (Moscow)
- PMTFB (Stavropol)
- Tyumen-Moscow (Moscow)
- Kolis (Moscow)
- Permskaya Commodity Exchange (Perm)
- Ukrainskaya Sakharnaya Birzha (Kiev)
- St Petersburg Invest & Contr commodity ex (St Petersburg)
- Kolis Commodity Exchange (Moscow)
- Voronezhskaya Agriculture Industry Exchange (Voronezh)
- Kazakhstan Paper Exchange (Alma-Ata, Kzak)
- Dom Uchenykh Exchange (Moscow)

APPENDIX 2. List of Selected Average Seat Prices for Comm.
Exchs by Ec Region (Srce: Ekonomicneskaya Gazetta)
==

I. Average Price (Rubles) per Seat, Dec 10-12, 1991

1.	Northwest:	St Petersburg Stock Exg (St Pet)	500,000/1
		Novgorod (Novgorod)	400,000/4

		Regional Average	130,000/1
2.	Center:	Bryzh for land/produce (Moscow)	8,500,000/1
		"Moscow fur auction" (Moscow)	2,000,000/1
		Moscow Comm Exch (Moscow)	1,500,000/1
		Moscow Interrepublic Universal	900,000/1
		Byrzh Russian Paper (Moscow)	650,000/1
		Russian grain Comm Exch	600,000/1
		Moscow Central Byrzh	350,000/1
		Moscow Union for Private Ent.	290,000/1

		Regional Average	1,348,750/1
3.	Volga-Vyatka:	Byrzh Nizhny Novgorod (Gorky)	350,000/1
4.	Volga:	Privolskaya (Volgograd)	500,000/1
		Samara Byrzh (Samara)	750,000/2

		Regional Average	415,667/1
5.	Urals:	Ural Byrzh Center (Ekat)	975,000/1
		Urals Byrzh (Ekat)	680,000/1
		Perm Commodity Exch	400,000/1
		Chelyabinsk Universal	1,400,000/20
		Udmurt Republican Universal	250,000/5
		Urals Stock Exch (Ekat)	250,000/5

		Regional Average	119,848/1
6.	West Siberia:	Omsk Commodity & Stock Exch	400,000/1
		Siberian Stock Exch (Novisib)	260,000/1
		Tyumen/Moscow Byrzh "Germes" (Ty)	1,050,000/5
		Zhelenograd Stock Exch (Kemerovo)	700,000/10

		Regional Average	138,824/1
7.	Far East:	Khabarovsk Comm & Stock Exch	400,000/1
		Vladivostok Commodity Exch	390,000/1
		Primorskiy Byrzh (Prim)	230,000/5

		Regional Average	145,714/1

		Russian Federation Average	340,333/1

```
8.  SW Ukraine:     Kiev Universal Exch              600,000/1
                    Kiev Comm & Stock Exch          150,100/1
                                                    -- -------
                    Regional Average                250,000.1

9.  Dons-Dniepr:    Ukr/Siberia (Kharkov)           200,000/1
                    Kharkov Comm & Stock            300,000/3
                                                    ---------
                    Regional Average                125,000/1

10. S. Ukraine:     Odessa Comm Exch                400,000/1
                    Odessa Agr. Byrzh               200,000/1
                                                    ---------
                    Regional Average                300,000/1
                    ------------------------------------------
                    Ukraine Average                 205,556/1
                    ------------------------------------------
11. Belarus:        Belorussia Univ Exch (Minsk)    250,000/1

12. Moldova:        Kishinev Universal Comm Exch     65,000/1
                    ------------------------------------------

13. Latvia:         Latvia Universal (Riga)         700,000/1
                    Latvian Unibalt  (Riga)         405,000/5
                                                    ---------
                    Regional Average                194,167/1

14. Estonia:        Estonian "Kontakt" Comm Exch    230,000/1
                    Tallinn Comm Exch               380,000/3
                                                    ---------
                    Regional Average                152,500/1

15. Lithuania:      Vilnius Byrzh (Lith)            175,500/1
                    ------------------------------------------
                    Baltic Average                  172,167/1

16. Kazakhstan:     Kazakh Central Byrzh (Alma-Ata) 400,000/1


        II.  Average Price per Seat, 24 - 26 December 1991


1.  North:          Murmansk                        250,000/1

2.  Northwest:      St Petersburg Stock Exch        500,000/1
                    Viborg Free Universal Exch (St P) 600,000/3
                    Novgorod Comm Exch              400,000/4
                                                    ---------
                    Regional Average                187,500/1

3.  Center:         Byrzh for land/produce (Moscow) 8,500,000/1
                    Russian Comm Exch (Moscow)      6,550,000/1
                    Moscow grain Commo Exch         3,850,000/1
```

```
                       Moscow Comm Exch                      2,350,000/1
                       "Moscow fur auction"                  2,000,000/1
                       Moscow Interrepublican Exch           1,000,000/1
                       Byrzh Russian Paper (Moscow)            750,000/1
                       Russian grain Comm Exch (Mosc)          650,000/1
                       Moscow Central Byrzh                     350,000/1
                       Mosc. Unoion for Private Ent.           280,000/1
                                                             ------------
                       Regional Average                      2,628,000/1


4.   Volga-Vyatka:  Byrzh Nizhny-Novgorod (Gorky)             350,000/1

5.   Volga:         Samara Byrzh (Samara)                     750,000/1
                    Privolskaya Comm Exch (Volgograd)         500,000/1
                                                             ----------
                    Regional Average                          625,000/1

6.   N. Caucasus:   Kuban Commo Exch (Krasnodar)              900,000/1
                    Sochi Comm & Stck Exch (Krasnodar)        850,000/1
                    Sochi Comm Excg (Krasnodar)               650,000/2
                                                             ----------
                    Regional Average                          600,000/1

7.   Urals:         Sverdlovsk (Ekat)                       1,350,000/1
                    Ural Byrzh Center (Ekat)                  975,000/1
                    Perm Comm Exch                            170,000/1
                    Chelyabinsk                             1,400,000/20
                    Udmurt Republican Comm & Stock            250,000/5
                    Urals Stock Exch (Ekat)                    90,000/2
                                                             ------------
                    Regional Average                          141,167/1

8.   W. Siberia:    Nizhnevartovsk oil Byrzh (Tymn)         3,500,000/1
                    Tyumen/Moscow Byrh "Germes" (Tym)       1,200,000/1
                    Tyumen TFB (Tyumen)                      1,000,000/2
                    Surgut TSB (Tyumen)                        900,000/2
                    Omsk TSB                                   350,000/2
                    Siberian Stock Exch (Novisib)              350,000/2
                    Zhelenograd Comm Exch 9Kemerovo)           700,000/10
                                                             ------------
                    Regional Average                         `421,053/1

9.   Far East:      Khabarovsk Comm & Stock                   400,000/1
                    Vladivostok Comm & Stock (Prim)           390,000/1
                    Magadan Byrzh                              650,000/2
                    Primorskiy Byrzh                          230,000/5
                                                             ----------
                    Regional Average                          185,556/1
                                                             ------------
                    Russian Federation Avg                    546,845/1
```

```
10. SW Ukraine:   Kiev Universal Comm Exch              600,000/2
                  Kiev Universal Stock exch            150,000/1
                  Ukraine MB "Vektor" (Kiev)           200,000/2
                                                       ----------
                  Regional Average                     190,000/1

11. Don-Dnieper:  Dnepropetrovsk Comm & Stock Exch     660,000/1
                  Ukraine/Siberian Comm & Stk (Khakv)  210,000/1
                  Kharkov TSB                          300,000/3
                                                       ----------
                  Regional Average                     234,000/1

12. S. Ukraine:   Odessa Stock Exch                    400,000/1
                  Odessa Agr. Byrzh "Svetlana-K"       200,000/1
                                                       ----------
                  Regional Average                     300,000/1
                  --------------------------------------------------
                  Ukraine Average                      226,667/1
                  --------------------------------------------------

13.   Belarus:    Belorussian Universal exch           250,000/1

14.   Moldova:    Kishinev Universal Comm Exch          65,000/1
                  --------------------------------------------------

15.   Latvia:     Latvian Universal                    800,000/1
                  Latvian Unibalt Universal            400,000/5
                                                       ----------
                  Regional Average                     200,000/1

16.   Estonia:    Estonian TSB                         230,000/1
                  Tallinn Comm & Stock Exch            380,000/3
                                                       ----------
                  Regional Avg                         152,500/1

17.   Lithuania:  Vilnius Byrzh                        350,000/1
                  --------------------------------------------------

18. C. Asia:      Alma-Ata Stck Exch (Kazakstan)     1,500,000/1
                  Kazakh Stock Exch (Alma-Ata)       1,000,000/1
                  Guryev "Tenghz"                      550,000/1
                  Kazakh Central Byrzh (Alma-Ata)      400,000/1
                  Kazakh Universal & Comm Exch         625,000/2
                  Karaganda Byrzh (Kurgan, Kazakh)     190,000/1
                                                       -----------
                  Regional Average                     609,286/1
```

```
/******************************************************************
*                                                                *
*                                                                *
*                    QUADRAT ANALYSIS PROGRAM                     *
*                                                                *
*                    Steve Liska,  31 July 1992                  *
*                                                                *
*        "Examination of the distribution of Market Economy      *
*                                                                *
*           initiatives in the former Soviet Union using the     *
*                                                                *
*                    Poisson Process Model                       *
*                                                                *
*        -----------------------------------------------------   *
*                                                                *
*                                                                *
*            Test Case:   The following  analysis seeks to analyze *
*        the  spatial pattern of market economy initiatives in the *
*        former Soviet Union.  Examples include state enterprises, *
*        cooperatives, joint ventures, foreign trade associations, *
*        and recently, commodity exchanges.  The test is to deter- *
*        mine whether the pattern is  1) random,  2) uniform,  or  *
*        3) clustered.  The Poisson  frequency also  examines the  *
*        probability of certain events occuring within a calculated *
*        area cell.                                               *
*                                                                *
******************************************************************/


#include <stdio.h>
#include <math.h>

#define SIZE 35
#define mosc.num "input.data"
float bar(float set, float arr[] );
float fact(float);

main( )
{

  float number;              /*  for factorial computation  */
  float rpts;                /*  the total number of points (123) */
  float ncells;              /*  the total number of cells (121)  */
  float xbar;                /*  (rpts / ncells) or (# pts / # cells)  */
  float xi[SIZE];            /*  the number of points in the ith cell */
  float nx[SIZE];            /*  the number of cells containing x points */
  float xdif;                /*  the difference, (xi - xbar)  */
  float xdif2;               /*  the square of xdif */
  float sumdif;              /*  the sum of (xi - xbar) differences  */
  float variance;            /*  the variance of the cooperative census */
  /*float fact(float);*/     /*  the factorial computation  */
  float px[SIZE];            /*  the Poisson probability  */
  float pxn[SIZE];           /*  (the Poisson prob. * ncells)  */
  float goodft;              /*  ratio of varnce / xbar  */
  int i, j, k;               /*  the ith, jth, and kth values  */
  float x1pow, x2pow;        /*  the power functions */



  FILE *in_file;

  in_file = fopen( "mosc.num", "r" );
```

```c
    printf("This program computes the (Poisson) probability, px, that a single\n");
    printf("specified cell contains exactly x points at the termination of an\n");
    printf("experiment where r points are placed independently, and one at a time,\
n");
    printf("into a grid of n equal-sized cells and where each placement has a\n");
    printf("p = 1 / n probability of landing in the specified cell.\n");
    printf("\n");

    printf("The input data file 'mosc.num' reserves the first line for the total\n"
);
    printf("# of points (rpts) and the second line for total # cells (ncells).\n");
    printf("The third and all remaining input lines hold the # points in the ith\n"
);
    printf("cell (xi[i]) and the number of cells (nx[i]) containing x points.\n");
    printf("\n");

    fscanf(in_file, "%f %f", &rpts, &ncells);
    printf("rpts = %.0f   ncells = %.0f\n", rpts, ncells);
    printf("\n");
    for (i = 0; i < 35; i++) {
        fscanf(in_file, "%f %f", &xi[i], &nx[i]);
     /* printf("xi[i] = %.0f\n   nx[i] = %.0f\n", xi[i], nx[i]); */
        }
    fclose(in_file);

    xbar = (rpts / ncells);
    printf("xbar = %f\n", xbar);
    printf("\n");

    sumdif = 0;
    for (i = 0; i < 35; i++) {
        xdif2 = (xi[i] - xbar) * (xi[i] - xbar);
        sumdif = sumdif + (nx[i] * xdif2);
        variance = (sumdif / ncells);
        }
    printf("sumdif = %5.3f   variance = %5.3f\n", sumdif, variance);
    printf("\n");

    for (i = 0; i < 35; i++) {
        x1pow = 1 / (pow(2.71828, xbar));
        x2pow = pow(xbar, xi[i]);
        px[i] = (x1pow * x2pow) / fact(xi[i]);
        printf("Poisson Probability:  px[%d] = %5.4f\t", i, px[i]);
        pxn[i] =  (px[i] * ncells);
        printf("Poisson Frequency:  pxn[%d] = %5.4f\n", i, pxn[i]);
        }
    printf("\n");

    /*  Goodness of Fit  */

    goodft = (variance / xbar);
    printf("Goodness of Fit:  goodft = %5.4f\n", goodft);
    printf("\n");
    if (goodft < 1)
        printf("The pattern is uniform.");
    if (goodft == 1)
        printf("The pattern is random.");
    if (goodft > 1)
        printf("The pattern is clustered.");
    printf("\n");

    return(0);
}

float fact (float number)                    110
{
```

```
    if( number <= 1 ) {
        return( 1 );
    }
    return ( number * fact( number - 1 ) );
```

```
    if( number <= 1 ) {
        return( 1 );
    }
    return ( number * fact( number - 1 ) );
```

APPENDIX 4

TEST FOR DETERMINANTS IN THE DIFFUSION OF COMMODITY EXCHANGES

Theory proposes 5 individual indicators leading to the adoption of commodity exchanges in the former Soviet Union:

* (1) gradients radiating from mature DGP's.
* (2) clustering of exchanges and earlier market innovations i.e. .... business COOPERATIVES.
** (3) former CENTRAL DEPARTMENTS turned to capitalise on existing staff, databases, communication equipment.
** (4) Giant INDUSTRIAL PLANTS create exchanges in order to survive in new environment less certain supply/demand.
** (5) former BLACK MARKETEERS begin to function openly, on large scale market principles.

* Perestroika events (1988-89)
** Vestnik Statistiki (Moscow monthly) propositions

Surrogate Variables for each Indicator above:
==

Dependent X variable: TOTCOMMX = Total Commodity Exchgs
                                   in Russia (1990-92)

for: (1) DGP: MCSZ = Main City Size of Province (1990)

      (2) COOPERATIVES: #COOPS = Number of cooperatives engaging in foreign trade per province (1990).

      (3) CENTRAL DEPARTMENTS: CPSU = CPSU members per 1K residents (1985).

      (4) INDUSTRIAL PLANTS: INVSMT = Percent share of investment per province, (1989).

      (5) BLACK MARKETEERS: SALPC = Retail Sales per capita (1986).

Regression Analysis.

Table 1. Correlation Report:

	MCSZ	#COOPS	CPSU	INVSMT	SALPC	TOTCOMX
MCSZ	1.0000					
#COOPS	0.9638	1.0000				
CPSU	0.3921	0.4171	1.0000			
INSMT	0.4950	0.4861	0.0013	1.0000		
INVSMT	0.4529	0.4701	0.3840	0.4755	1.0000	
TOTCOMX	0.8761	0.8691	0.3156	0.6568	0.5376	1.0000

RESULTS OF CALCULATIONS FOLLOW: ------------>

$$TOTCOMMX = -2.76 + 0.0017\ MCSZ + 0.0376\ \#COOPS - 0.0017\ CPSU +$$
$$ (0.0007)* (0.0252) (0.0181)$$

$$+ 0.6394\ INVSMT + 0.0017\ SALPC$$
$$ (0.1524)** (0.0012)$$

$$n = 71;\ R^2\ (adj.) = 0.8342;\ F = 71.44;\ ** = sig\ at\ .001$$
$$* = sig\ at\ .05$$

Numbers in parentheses are std regression (beta) coeffs.

Results show that the legacy on industrial giants (investment share) is the most dominant factor influencing the level of adoptions of commodity exchanges in the former Soviet Union. One other variable is significant at the .05 level; main city size. There does not seem to be any major multi-collinearity problems present. Naturally, selection of other surrogate variables will produce different results.

APPENDIX 5: Discriminant Analysis Results of Adopters vs.
Non-Adopters of Commodity Exchanges (2 Tests)

I.   Test # 1 (n = 114 areal units; 60 variables)

          Case 0 = No Commodity Exchange Adoptions
          Case 1 = at least one Commodity Exchange Adoption

 Stepwise IN-Variable Selection (F-to-enter Value > 1)

Variable	F-Val	F-Prob	Variable	F-Val	F-Prob
TEKNIKUM	1.1	0.2937	PS	12.0	0.0008
FOOD	3.3	0.0738	PMET	2.8	0.0969
TOOL	1.0	0.3185	MPT	26.0	0.0000
DOCP10	4.6	0.0338	COBP10	2.2	0.1418
SERPC	3.9	0.0520	CAFP10	1.8	0.1824
SALPC	1.9	0.1763	HEATING	2.7	0.1007
MCSZ	5.3	0.0232	FORTRASS	4.7	0.0300

Overall Wilk's Lambda = 0.4309
Variable descriptions in TABLE 6.3, Page 26.

Regression and Discriminant Coefficients

Classification Variable: Total Exchanges

Group	0 (Regr)	1 (Regr)	0 (Dis)	1 (Dis)
CONSTANT	1.097382	-0.097382	-67.38676	-73.10566
TEKNIKUM	-0.001429	0.001429	0.091983	0.105151
PS	-0.106559	0.106559	1.146517	2.129332
FOOD	0.042202	-0.042201	1.019351	0.630122
PMET	0.030901	-0.030901	0.591103	0.306099
TOOL	-0.057635	0.057635	6.434885	6.966464
MPT	-0.022696	0.022696	0.245446	0.454778
DOCP10	0.012741	-0.012741	0.545050	0.427536
COB10	0.022616	-0.022616	2.254649	2.046056
SERPC	-0.014456	0.014456	-0.038941	0.094393
CAFP10	-0.026716	0.026716	2.657102	2.903511
SALPC	-0.000431	0.000431	-0.019470	-0.015492
HEATING	0.002591	-0.002591	0.332738	0.308840
MCSZ	-0.000228	0.000228	0.000458	0.000256
FORTRASS	0.013544	-0.013544	-0.073939	-0.198858

Classification Matrix using IN-Indepen. Variables

Group	Counts Table		
	P(All)	P(0)	P(1)
A (All)	114	52	62
A (0)	51	43	8	---> 85.9% Cases
A (1)	63	9	54	predicted correctly

II. Test # 2 (n = 141 provinces; 14 variables)

Stepwise IN-Variable Selection (F-to-enter > 1)

Variable	F-Val	F-Prob.	Variable	F-Val	F-Prob.
KSQM	1.4	0.2434	POP90	39.3	0.0000
PPSQQKM	3.5	0.0624	UR%90	18.3	0.0000
MCGRWT	2.0	0.1607	CARS/KCO	3.2	0.0761
SALESCAP	8.4	0.0043	FORASSOC	18.6	0.0000

Overall Wilk's Lambda = 0.5879
Variable descriptions in TABLE 6.3, page 26

Regression and Discriminant Coefficients

Classification Variable: Total Exchanges

Group	0 (Regr)	1 (Regr)	0 (Disc)	1 (Disc)
CONSTANT	2.149843	-1.149843	-34.79742	-45.78347
KSQM	0.000089	-0.000089	-0.002668	-0.003270
POP90	-0.000200	0.000200	0.002000	0.003350
PPSQQKM	0.001583	-0.001583	-0.004496	-0.015147
UR%90	-0.010131	0.010131	0.372025	0.440262
MCGRWT	-0.001754	0.001754	0.044931	0.056744
CARS/KPO	-0.000121	0.000121	0.000419	0.001237
SALESCAP	-0.000388	0.000388	0.028117	0.030732
FORASSOC	0.021186	-0.021186	-0.637541	-0.780235

Classification Matrix using IN-Indep Variables

Groups	Counts	Table	
	P(All)	P(0)	P(1)
A(All)	141	83	58
A(0)	75	65	10
A(1)	66	18	48

-----> 80.1 % of cases predicted correctly
        using independent variables above

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